MACHINE TOOL BLUE BOOK

AUGUST 1943

ONLY ONE WORK SET-UP for *all* operations with

***Fray* RAM TYPE No. 7-B UNIVERSAL MILLING MACHINES**



The 10" cross movement of the ram above the work, as well as the 12" transverse movement of the ram, combined with the 360 deg. rotation of the turret head—give a range of operations with one work set-up that is *not possible* with any other milling machine.

In addition to the controlled movement of the ram and turret, the "All-Angle" milling head can be rotated 360 deg. in horizontal or vertical planes, so that the head can be instantly set to any angle or compound angle.

For positive and accurate travel, ball cranks mounted on feed screws carry 3" dials and are calibrated in one-thousandths. The table working surface measures 7½" x 29", and has a cross feed travel of 7". Table stops calibrated in one-thousandths.

These are precision tools in every sense of the word—designed by toolmakers for use by toolmakers.

FRAY MACHINE TOOL CO.

501 WEST WINDSOR ROAD • GLENDALE 4, CALIFORNIA

Manufacturers of Fray Micrometer Offset Boring Heads, and Fray "All-Angle" Milling Attachments

Write for descriptive literature





For steel tubing they use a MARVEL No. 8 Band Saw at Douglas Aircraft

You'll find different types of MARVEL Saws in the giant Douglas Aircraft Plant at Santa Monica each doing work in which it surpasses all other saws. Take the MARVEL No. 8 shown above, it has proven "an excellent piece of equipment" for cutting-off steel aluminum and aluminum alloy tubing of many types and sizes in innumerable lengths and at all angles because the blade can be fed to the work at any angle from 45° right to 45° left.



ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 Bloomingdale Ave., Chicago, U.S.A.
Eastern Sales Office: 225 Lafayette St., N. Y.

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Three Ways *with* HOBART *Simplified* Arc Welding



• These three exclusive features account for a large portion of the success which Hobart Welders have attained.

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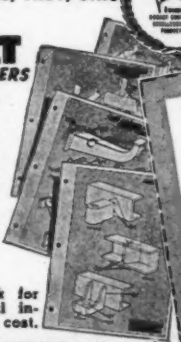
Priorities control the entire production of Hobart Welders, so be sure to give us your priority with your order.

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"Simplified" ARC WELDERS

Hundreds of Welding Designs applicable to your work . . . This new Hobart Service, particularly for designers, offers suggestions for welded-design change-over. In handy, loose-leaf supplement form.

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FOR SMALL HOLE, CYLINDRICAL AND CONCENTRIC GRINDING



External Spindle and Tailstock



Internal and External Spindles in Turret

The Rivett No. 104 is a simple, accurate grinder suited [illegible] tool making as well as precision manufacturing [illegible] operation and its [illegible] for internal and external [illegible] or external grinding [illegible] selectively [illegible] work [illegible] concentric grinding of internal and external surfaces at one chucking, turret carrying both internal and external spindles may be used.

ARMY E NAVY

SPECIFICATIONS

Grinding capl. hole dia.	up to 3"
Grinding cap. outside dia.	up to 3"
Automatic table travel	
Standard	1/4" to 2"
Special	1/4" to 4"
Hand table travel	11"
Swing over table	8"
Center distance	6"
Workhead swivel	30°
Table swivel	5°
Cross feed graduations	
Standard	.0005"
Special	.0001"
Travel of cross slide	1"
Collet capacity	3/4"
Step chuck capacity	6"
Jaw chuck capacity	6"
Workhead spindle speeds	200, 375, 600 r.p.m.
Grinding spindle speeds	
Standard int. 21000 and 25000 r.p.m.	
External	3800 r.p.m.
Net weight with motors	1750 lbs.



For Further Description Write for Bulletin 104



RIVETT LATHE & GRINDER INC.

BRIGHTON, BOSTON, MASS.

HARDINGE



SPECIFICATIONS:
1" collet capacity, 6" step chuck capacity, 5" jaw chuck capacity, 9" swing, eight spindle speeds up to 4000 R.P.M.

HIGH SPEED PRECISION
SECOND OPERATION MACHINE

• A common error of production departments has been the purchase of large, expensive machines, capable of performing many operations — and then confine them to one use — second operation work. Immediately, the purpose for which the machine was purchased — many operations — is defeated.

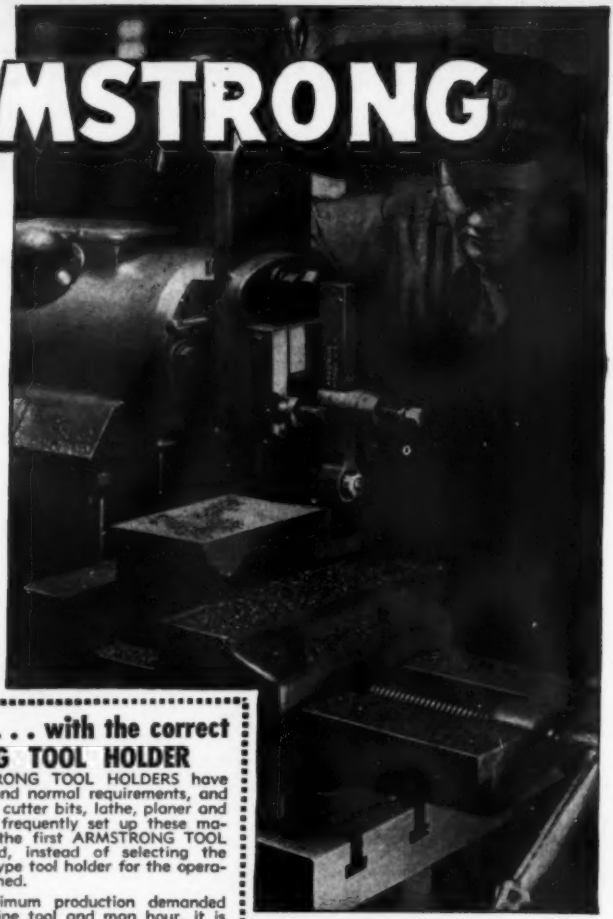
Now the trend is to Hardinge — designed only for second operation work. The initial low cost, the versatility and unusual capacity, without the set-up complications involved with large machines, created an ever-increasing demand for this machine.

The double tool cross slide and turret take standard tooling. The six-position tilted turret has an automatic indexing and locking head with six independent travel stops.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR

HARDINGE
ELMIRA, N.Y.

ARMSTRONG



Start right . . . with the correct ARMSTRONG TOOL HOLDER

Because ARMSTRONG TOOL HOLDERS have strength far beyond normal requirements, and take all standard cutter bits, lathe, planer and shaper operators frequently set up these machine tools with the first ARMSTRONG TOOL HOLDER at hand, instead of selecting the correct size and type tool holder for the operation to be performed.

Today with maximum production demanded from every machine tool and man hour, it is important that every operation be **started right**, with the correct ARMSTRONG TOOL HOLDER . . . the tool holder, especially designed for that operation and which holds the cutter at the correct cutting angle, gives the most efficient tool approach, and cuts efficiently even at greatly stepped-up speeds and feeds.

Write for an ARMSTRONG C-39 Catalog today, and check to be sure that you are using the correct ARMSTRONG TOOL HOLDERS for each operation.

ARMSTRONG BROS. TOOL CO.

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Eastern Warehouse and Sales:
199 *Lafayette St., New York*

Machine Tool Blue Book

Hitchcock Publishing Co., 542 So. Dearborn St., Chicago 5

Published Monthly *Volume 39, No. 8*

AUGUST 1943

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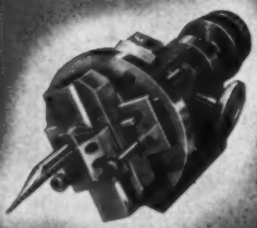
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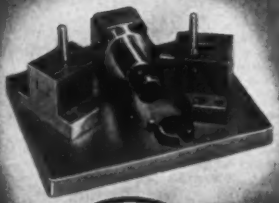


The PERFEX Name

WHAT IT MEANS TO YOU..





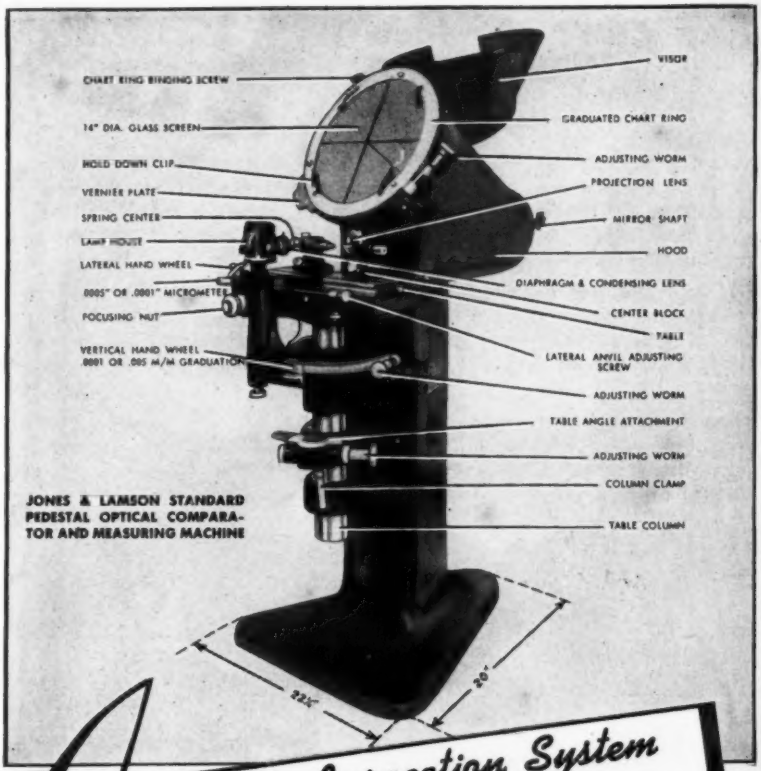


THE NAME PERFEX represents a company that was established before the war by men who had years of experience in the manufacture of precision gages. It is the name that has been associated with accuracy, for accuracy has been the creed of the founders of the Perfex Gage & Tool Company. It is this creed, plus a thorough engineering background in gage making that has placed the name PERFEX among the leaders of gage manufacturers. Yes, PERFEX is a name that means much to its clients for they know that behind that name is a responsible organization that is built upon a sound foundation of skill and integrity. For complete information on the many types of fine gages PERFEX manufactures, write our sales department today!

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A Complete Inspection System

FOR TOOLROOM OR SHOP

Thousands of Jones & Lamson Optical Comparators are in use today for the inspection and measurement of a great variety of parts where, often, other methods had failed or had been too costly. Their use has resulted in better tools and gages, greater efficiency in inspection and substantial saving through the elimination of costly mechanical gages.

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J&L

PROFIT-PRODUCING MACHINE TOOLS

You Can't Produce With Materials

IT TAKES more than steel, aluminum, magnesium and rubber to make fighting and defense equipment. Admitedly, many basic materials are the first requirement, but they must be cut, bent, shaped, moulded, cast and so on by *machines*. And a machine which is out of commission can do no work; the materials remain as inert chunks of matter.

To keep machines in first class operating condition, follow a mechanical fitness program, with dogged attention to basic and seemingly obvious details. Some of the details to keep after on CINCINNATI Vertical Hydro-Tel Milling Machines are tabulated on the following page:



Left: Check the accuracy of level, both table and rear base, at about two month intervals. Accuracy begets accuracy.



Above: Check oil levels daily and maintain an adequate supply of clean oil in the reservoirs. "Starved" pumps can exert no more effort than starved people.



Left: Periodically remove and clean all filters; (cloth filtering type for table way oil; metallic type for hydraulic oil; stone filters added for machines equipped with profiling unit.) Wash in naphtha or similar cleaning fluid. Use emery cloth for stone filters; blow out metallic and stone filters with air blast.

Alone . . .

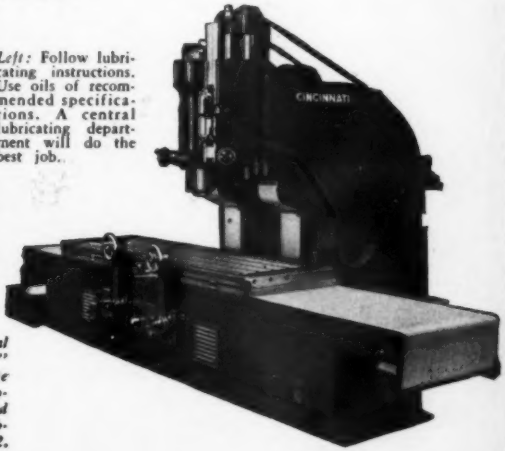
CINCINNATI

1. *Level the machine periodically.* A good rule is to check the accuracy of level every two months, of both table and ram.
2. *Follow lubricating instructions.* A lubricating schedule tag tied to the machine will serve as a convenient reminder.
3. *Use clean containers for oil,* especially for the hydraulic oil.
4. *Clean the oil filters periodically.* This is very important for hydraulic oil filters, both cartridge and stone types.
5. *When not using power feeds place feed series lever in "SLOW" position.* Eliminates wear in one spot.
6. *Always stop spindle drive motor before changing spindle speeds.* Save the gears.

These chores are simple and easy to do, and require little time. Make them a habit and avoid the ills fostered by neglect of large hydraulic machines . . . chatter of traveling units . . . inaccurate work . . . low power efficiency . . . uneven traverse . . . no response to movement of levers. Give your Hydro-Tel a break . . . give it a chance to make a production record equal to your attendance record.

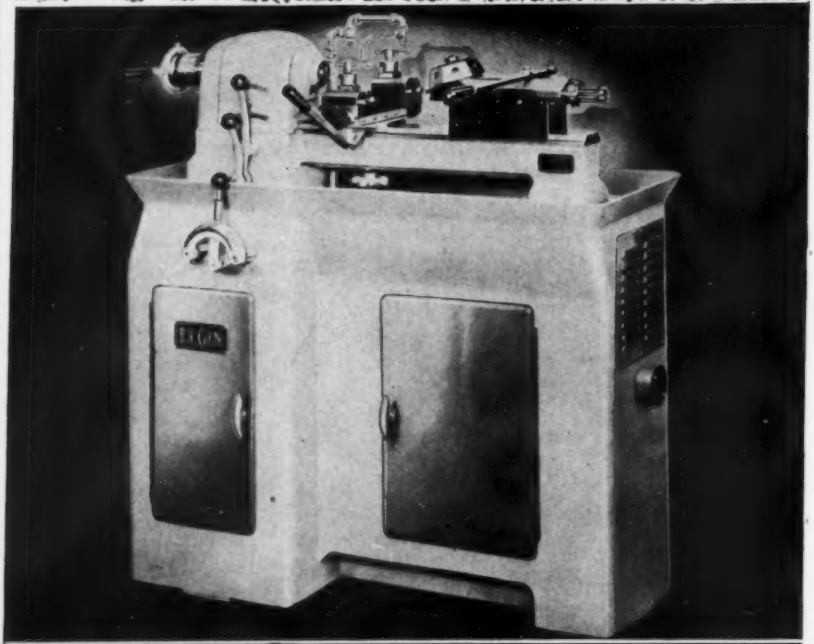


Left: Follow lubricating instructions. Use oils of recommended specifications. A central lubricating department will do the best job.



Right: *CINCINNATI 28" Series Vertical Hydro-Tel Milling Machine. A "bear" for heavy stock removal, with a delicate "feel" for accurate die-sinking and profiling jobs. Complete description and engineering specifications may be obtained by writing for catalog M-1018-2.*

The Greatest A



ELGIN TO

1773 BERTEAU AVE. AT RAVENS

dvancement Since-

The Development of the Enclosed Head . .

THE NEW VARIABLE SPEED DRIVE PRECISION HAND SCREW MACHINE

Variable Speed Drive 115 to 3700 R.P.M. Speeds changed instantly without stopping spindle. No Belts to Change. Correct speed for every operation. High torque at Low Speed. Speed control from low to high speed in 90 control sector. Equipped with precision ball bearings thru-out. V belt drive. All pulleys average size; No lost horse power.

WRITE FOR FULL DETAILS

OL WORKS

WOOD AVE., CHICAGO 13, ILLINOIS



BOKUM TOOLS

Accept More Feed—Increase Production

Since the greatest cutting force is always directed toward its largest cross section, the Bokum Tool can accept more feed than ordinary boring tools; therefore, it completes the job faster.

Original form of tool is never changed through resharpening.

For complete description of these tools send for the catalog that meets your particular needs.

For Super High Speed Tools, No. H-1139
For Carbide-Tipped, No. H-398

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C & W
SPECIAL PRECISION CUTTERS

C&W TOOLS

Special
High-Speed Steel

COUNTERSINKS
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COUNTERBORES
PROFILE CUTTERS
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SHAVING TOOLS
INTERLOCKING CUTTERS
FORM RELIEVED CUTTERS
CARBIDE-TIPPED TOOLS

For
Aircraft—Gun—War Industries







To meet the demands of the war program—ON TIME—C & W is constantly expanding plant capacity. C & W is one of the largest producers of special high-speed precision cutting tools—and has an outstanding record in meeting promised delivery schedules.

Write for illustrated pamphlet—
Consult us on your tool requirements.

C & W TOOL COMPANY



Have Helped to Make Possible

Faster Deliveries from DETROIT BROACH

The Detroit plant has been enlarged. This continued expansion of Detroit Broach Company facilities more than keeps pace with current demands put upon us for the design and manufacture of broaches and broaching accessories. It has made possible rapid reduction of "back-log" and is a promise of faster delivery on all orders.

Since the Detroit Broach Company was organized, the history of this company has been one of steady progress. With these additional facilities, Detroit Broach continues to be in a position to meet your broaching needs.

Shown above is a night photograph of the Detroit Broach Company plant in Detroit.

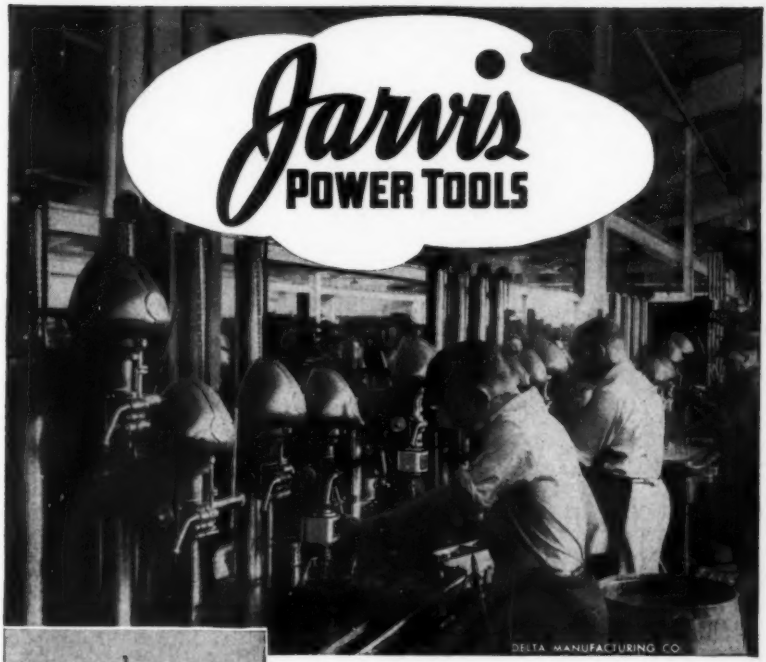
COMPLETE BROACH SERVICE

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DETROIT BROACH COMPANY

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Jarvis POWER TOOLS





JARVIS TAPPING ATTACHMENTS

drilling . . . countersinking . . . and TAPPING

In a continuous flow. No waste motion. No additional handling of parts. Jarvis Tappers — THE STANDARD on your multiple spindle drill presses. Capacities from No. 2-56 to 2".

THE CHARLES L. JARVIS CO., MIDDLETOWN, CONN.

TAPPING ATTACHMENTS • FLEXIBLE SHAFT MACHINES • GROUND ROTARY FILES

THE ANSWER TO

Accuracy



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★ GAGES
★ END MILLS
★ MILLING CUTTERS
★ FORM RELIEVED CUTTERS
★ SPECIAL TOOLS
★ REAMERS
★ COUNTERBORES

FALCON TOOL CO.

DETROIT, MICHIGAN

WIRE FOR DETAILS AND DELIVERY DATA—
WE'LL GIVE YOU QUICK ACTION!



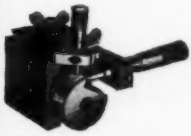
in less time

More and more men who have tight schedules to maintain are using Namco Circular Chaser Die Heads. They will tell you that these tools will turn out more work—per hour or per day. Class 3 threads, too, on a production basis.

Chasers are reground on blocks. Inserting a duplicate set in head is a two-minute job, and you are ready to cut identical threads, without "trying for size" and without work spoilage.

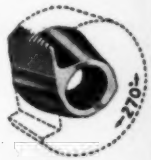
In the same rigid head, circular thread chasers may be interchanged with hollow milling cutters and blocks.

Capacities: .056" to 4⅛"—revolving or stationary type. Send for Catalog D-42.



Namco Micrometer Gauge

determines correct amount of metal to remove for Circular Chaser grind, and double-checks precision after grinding.



Namco Circular Chasers

may be ground through 270° of circumference. They last 10 to 30 times longer, with no loss of precision.

THE NATIONAL ACME CO.

170 EAST 131ST STREET • CLEVELAND, OHIO

ACME-GRIDLEY 4 & 6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • THE CHRONOLOG • LIMIT AND CONTROL STATION SWITCHES • SOLENOIDS • CENTRIFUGES • CONTRACT MANUFACTURING

COMMERCIAL HEAT



1. MORSE TAPER OR STRAIGHT SHANK DRILLS

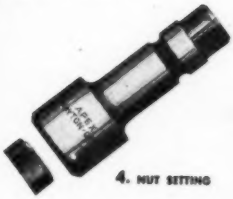


2. TAPPING

4 Operations with minimum changing time



3. STUD SETTING



4. NUT SETTING

It's no trick at all to change from one tool to another with APEX Quick Change Drill Chucks. Even green operators can do it—*with one hand*—without stopping or even slowing down the machine.

Apex Chucks are for use in drill presses, radials, multiple spindle machines, lathes, hand screw machines, tapping machines, electric and air tools. Shanks other than Morse Taper, can be furnished to suit machine spindle.

The collets are driven by hardened ball nosed plungers and are guaranteed not to fall out during the life of the chuck. Plungers are so designed that dirt cannot clog the hole and interfere with operation of the chuck. Write for catalog 14.

APEX

THE APEX MACHINE & TOOL CO., DAYTON, OHIO

Manufacturers of Safety Friction Tapping Chucks, Quick Change and Positive Drive Drill Chucks, Vertical Float Tapping Chucks, Parallel Floating Tool Holders, Power Bits for Phillips, Slotted Head and Clutch Head Screws, Hand Drivers for Phillips and Clutch Head Screws, Aircraft Universal Joints, Flam and Universal Joint Socket Wrenches.

This Simple Principle of Design

Plus This Fool-Proof Heat Control

Guarantees that this Upton Electric Salt Bath Furnace

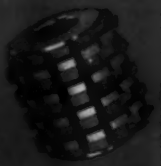
Will Harden this Hob so Accurately and Uniformly

that it Will Not Require Finish Grinding!









COMMERCIAL HEAT TREATERS DO BETTER WORK

with UPTON Electric Salt Bath Furnaces

The three principal problems of commercial heat treaters are all solved with Upton Electric Salt Bath Furnaces and Upton heat measuring controls.

Inexperienced help can use the Upton Heat Measuring Control to get perfect results, all the time.

Moly steels are easily handled with the Upton Electric Salt Bath Furnace.

Predictable size change is so exact—with Upton Electric Salt Bath Furnaces and the Upton Heat Measuring Control—that finish grinding is entirely eliminated on many tools—the same kind of tools that formerly required finish grinding.

Electrodes are out of the working area and can be changed in a few minutes, without special equipment and are usually of low cost, mild steel.

Upton Electric Salt Bath Furnaces are available for inspection in Detroit under actual *Commercial* heat treating conditions. Ask for complete information now. (To save time, why not give us a description of the work to be handled?)

Upton ELECTRIC FURNACE DIV.

UPTON Electric Salt Bath Furnaces are available for all types of Heat Treating from 300° to 2500° F.

DETROIT, MICHIGAN

Production Problem? Call SYNCRO — THEY'LL KNOW!



At present SYNCRO is furnishing precision parts for these Weapons of Victory.

SYNCRO specializes in solving various engineering and production problems. Let the broad, up-to-the-minute experience and ingenuity of SYNCRO engineers help you now — and after the war.

SYNCRO DEVICES inc.

3265 Bermuda Ave., Dept. MT-83, Ferndale 20, Michigan



MANUFACTURERS OF PRECISION MACHINE TOOL PRODUCTS



One way trip...to death!

A DEVASTATING MIGRATION occurs at irregular intervals in Norway. Countless hordes of rodents, known as "lemmings," emerge from nowhere. They seem to be led by some invisible Pied Piper.

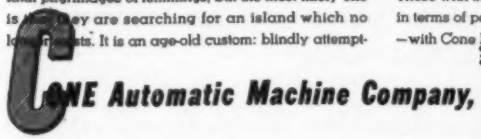
They travel in parallel lines three feet apart, straight through hay and corn stacks, across mountains instead of around... on and on to the brink of the sea. But they don't stop there. They swim straight to a point miles out in the ocean. Then they swim in circles until they drown!

Several theories have been advanced about the fatal pilgrimages of lemmings, but the most likely one is that they are searching for an island which no longer exists. It is an age-old custom: blindly attempting to live by landmarks which disappeared long ago.

The custom is represented by men who hooted at automobiles—by the men who laughed at Wright—and by the men who said democracy couldn't compete with a dictatorship. Happily, those men can be belied by a reliable index—that of the machine tool industry.

We gave Germany a 7-year head start, and passed her in about a year. For every one machine tool produced today by the Nazis, **we are now producing 5.**

The Conomatic, a key machine of peacetime industry, is well known to the production men of America. Those with their eye on the future are already thinking in terms of peacetime production ... victory is won —with Cone Multiple [illegible] machines.



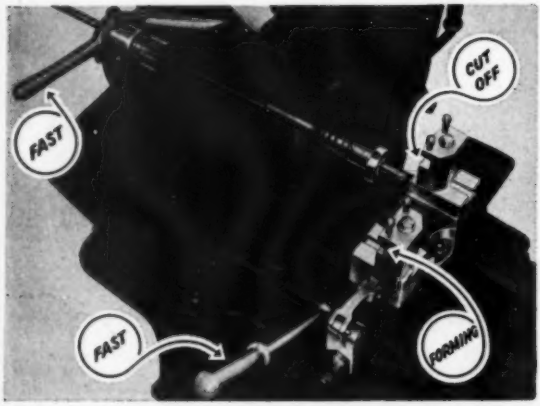
CONE Automatic Machine Company, Inc., [illegible] Vermont

KESSLER AERO PRODUCTS CO. TOOLS

Cut Lathe Operator's Time

CHUCKS AND RELEASES WHILE LATHE RUNS

75%



Made by

KESSLER
AERO PRODUCTS CO.
BURBANK, CALIF.

Kessler Aero Quick-Closing Collet attachment speeds production . . . permits barstock and tubing from 1/32" to ½" diameter to be fed through the head stock, chucked, machined, and released without stopping lathe. Accurate duplicate part work done on engine lathe at screw machine speeds. Just the tool for second operation work from Automatics and other large machines.

Kessler Aero Improved Lever-operated Cross-Slide for fast forming and cut-off work produces faster. Ideal for forming and machining castings.



Attachments fit Atlas, 9" So. Bend, Craftsman, Logan, and lathes of ¾" spindle capacity. Can be used with both 1-A and 3-AT collets.

IMMEDIATE DELIVERY

PRIORITY RATINGS MUST ACCOMPANY ALL ORDERS

Write For Literature

CENTER TOOL *Machine Shop Equipment* **CO. 153 CENTRE STREET, N.Y.**



STREAM-LINED
as a fighter plane



HOLDS FIRM
as the Marines on Guadalcanal



ACCURATE
as a Yankee sharpshooter

EFFICIENT
as America's production lines

IT HELPS WIN THE BATTLE OF PRODUCTION

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SPRING COLLET
Adapter

Special wrench supplied with each adapter. Standard spring collets available on order.

Designed in two simple parts, Thompson Spring Collet Adapter is quick and easy to apply... eliminates awkward, bulky chucks ...gets closer to the work, yet allows free access.

A better adapter means faster, better work. The Thompson trademark means a better adapter!



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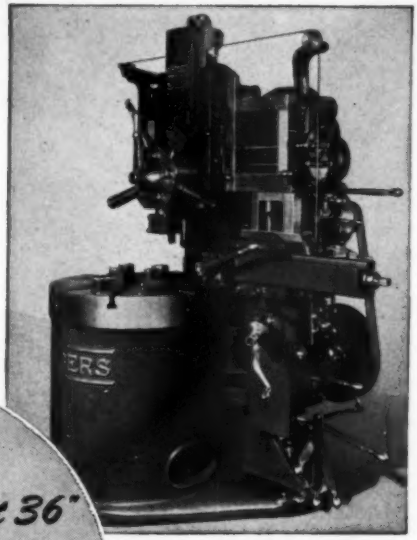
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AUTO-ORDNANCE *Corporation*

THOMPSON TOOL DIVISION

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Users put their "OK" on

ROGERS *"Perfect 36"* VERTICAL TURRET MILLS

with REPEAT ORDERS

● Customer satisfaction can be measured by REPEAT ORDERS. That is why such a high percentage of Rogers users reorder and reorder more and more Rogers *"Perfect 36"* Vertical Turret Mills.

A customer ordering several MORE Rogers Mills writes, "The machines we have are doing an excellent job for us and they are working steadily 20 hours a day."

Simplicity of design, operation and universal adaptability provide quicker set-ups . . . more finished work per hour per mill . . . and close tolerances. Rogers *"Perfect 36"* (capacity 36") Vertical Turret Mills are built in Standard and High Speed Models for boring, drilling, turning ferrous and non-ferrous castings and forgings.

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UP TO THE MINUTE...

Chicago Steel Brakes Are Modern in Design and Sturdy Construction



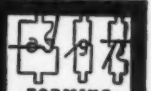
BOX AND PAN BRAKE—
Forms boxes or pans from one piece of metal. A straight brake as well as a box brake. Ideal for experimental shops.



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Improved to meet modern needs. Efficient and dependable ... sturdy and durable.



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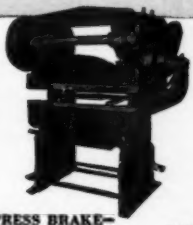
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ALL CHICAGO BRAKES are built of rolled steel welded sections which insure great strength, accuracy and long life. They are the most modern tools in design and workmanship to fit today's need for fast production sheet metal working machinery.

We Are The World's Largest Manufacturers Of Hand Bending, Power Bending And Power Press Brakes.

Aside from the CHICAGO line, we have built many special machines for intricate bending operations. Take advantage of our many years' experience by sending us any difficult bending problem you have.

DREIS & KRUMP MFG. CO.
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SMALL PRESS BRAKE—
Compact, powerful money-saving production unit. Replaces cumbersome costly machines that are expensive to operate. Uses same dies as larger machines.



LARGE PRESS BRAKE—
The only press brake which turns out perfect work without shims and crowned dies. Patented non-deflecting bed equalizes pressure over the full bending length and overcomes major fault in solid bed press brakes.

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for CLOSE TOLERANCES

RIGID SUPPORT
No balls, rollers, or races to wear out and cause uneven tooling.

BETTER LUBRICATION due to exclusive helical groove★



Use CMD *Helical Groove*
CENTERS
AND
CMD CENTER POINT OIL

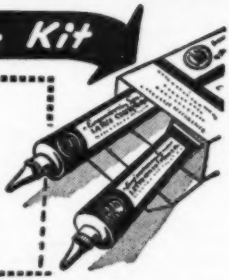
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- ☐ Send circular on CMD Helical Groove Centers
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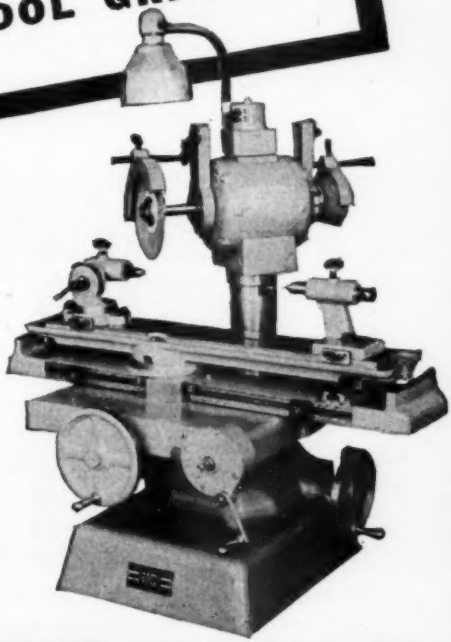


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THE NEW MODEL B600 UNIVERSAL TOOL GRINDER



Just off the Assembly Line.

Retaining all the fine features that characterized the Model A600 Grinder, and adding many features that distinguish the new model B600, K-O Engineers are proud to present this new and improved TOOL GRINDER!

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MULTIPLE CARRIAGE STOP



SETS 6 STOPS FOR DUPLICATE OPERATIONS

MODEL CS-1 FITS ATLAS, LOGAN, SOUTH BEND AND SIMILAR LATHES.

COMPLETE **$18.75**

- ACCURATELY GAUGES LENGTH OF CUTS
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- ANY ONE OF 6 STOPS AVAILABLE
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SETS 6 DIAMETER STOPS FOR REPEAT OPERATIONS



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- PREVENTS SPOILED WORK
- INCREASES PRODUCTION
- MAKES IT UNNECESSARY TO WORK BY DIAL GRADUATIONS

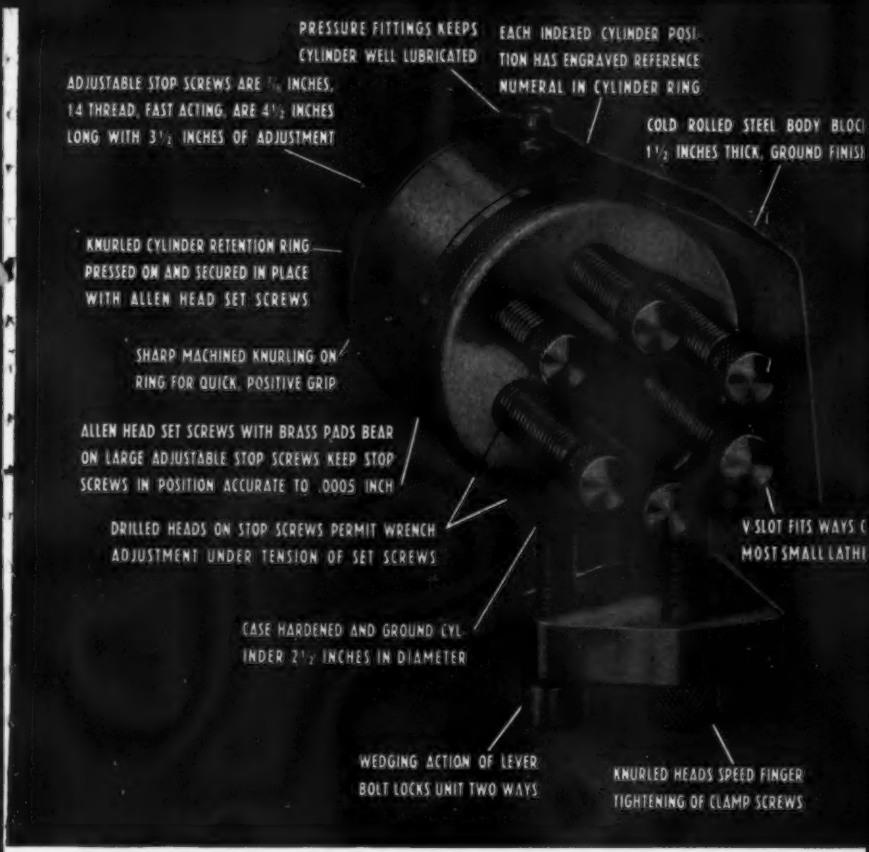
All necessary parts are supplied with each Multiple Cross Slide Stop.

IMMEDIATE SHIPMENT FROM STOCK. RUSH ORDER AND PRIORITY TODAY.

MODEL DS-1 FITS ATLAS, LOGAN, SOUTH BEND, AND SIMILAR LATHES. COMPLETE **$19.85**

SCHULTZ & ANDERSON CO.

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Here is a new lathe attachment developed in our own precision engineering plant which will quickly and accurately provide a positive lathe set-up for multiple operations. Its rotating cylinder, indexed and engraved with sequential numerals at each stop position is fitted with six, long, adjustable stop screws which act against a boss screwed onto the traverse carriage of the lathe. By setting each lathe stop screw to the desired length of carriage travel, six sequential cutting operations on one piece of work can be established on the first unit. Thereafter, unskilled lathe operators can quickly duplicate the original.

Our own experience indicates a saving of at least 35% of the time in setting up a job and 20% in running subsequent work by use of the VARD Multiple Lathe Stop.

ARMY E NAVY

VARD INC.

PASADENA, CALIFORNIA

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"Triple-Duty"★ LIVE CENTERS

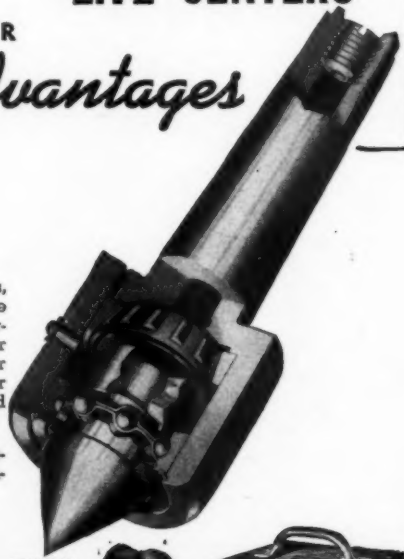
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Triple Advantages

1. **Take Heavier Loads**
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Get more work, faster work, out of lathes, millers, grinders, etc., with IDEAL Live Centers. They rotate with the work, permit heavier loads—faster speeds—deeper cuts. Highest precision ball bearings for radial load, tapered roller bearing for thrust load. All parts hardened and ground.

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IDEAL METAL ETCHERS

This new IDEAL, all-purpose Etcher indelibly and permanently marks all tools, parts, dies, etc., made of smooth-surfaced iron, steel and their alloys. With 14 different heat gradations available it etches legibly, easily, regardless of the hardness of the metal. Convenient ground clamp for etching large heavy parts and castings.

MOST COMPLETE LINE ON THE MARKET

FREE

Machine Tool Accessories Catalogue describes many IDEAL Products for speeding War Work.

IDEAL Sycamore

★ IDEAL COMMUTATOR DRESSER CO ★

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Sales Offices In All Principal Cities

a coolant transfusion...



Here's a Gray-Mills model H-10A giving high efficiency Coolant application service.

...to increase Tool Life and Production

GOOD machines can be made to do a better job by giving them a Coolant "Transfusion." And the simplest, most efficient way to apply these production-increasing, tool-saving coolants is with Gray-Mills "Controlled Flow" Portable Coolant Systems.

Gray-Mills Systems have increased the efficiency of hundreds of machines on operations like drilling, milling, sawing, grinding, honing, tapping, threading and cutting. They are quickly and easily set up to operate either as a permanent or temporary part of a tool. Sturdily built Gray-Mills Coolant Systems are available in both gear and centrifugal types, with capacities from 50 to 2,000-gal. per hour—controlled flow. Prices range from $39.50 to $189.50.

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STANDARD HEAVY DUTY "A" SERIES

With large capacity tanks incorporating baffles and screens. Capacities up to 165 gals. per hour—pressure, 50 lbs. p.s.i.



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Capacities up to 130 gals. per hour—pressure, 30 lbs. p.s.i.

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...complete portable coolant systems

Use GRAY-MILLS Flo-Bac COOLANTS . . . 5 types for most requirements—10 and 55 gal. containers—immediate delivery from your distributor or our plant

Primary Production Precision



for the BLUE PRINTS of TODAY and TOMORROW

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Lapointe Horizontal Broaching machine (HP-100) with complete automatic controls, rapid return speed and modern, engineered construction.

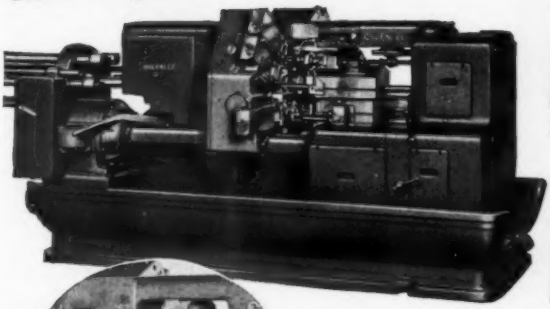


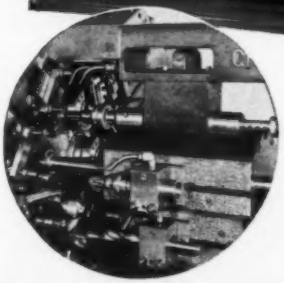
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LAPOINTE Machine Tool Company

HUDSON, MASSACHUSETTS, U.S.A.

DUAL PRODUCTION!

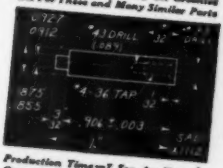




THREADING—TAPPING—REAMING
In 3rd, 4th, 5th, or 6th Positions

Accessible tooling area of Greenlee Six is shown above with tapping attachment mounted in No. 3 position . . . a feature that makes dual production and duplicate tooling a simple, easy matter. The flexibility provided by 4 positions for threading, tapping, and reaming permits better tooling set-ups . . . increases production. Machines are also built with dual threading clutches for producing both left and right-hand threads or with lead-screw for precision threading and tapping.

Double Set-Ups Are Easy On Greenlee Six For These and Many Similar Parts



Production Time—7 Sec. for Two Operations—Drilling, Forming, Tapping



Production Time—43 Seconds for Two Oper.—Face, Drill, Chamfer, C'Sink

WITH GREENLEE 6-SPINDLE AUTOMATICS . . .

★ For all-around efficiency, it's hard to beat the natural adaptability of a Greenlee Six-Spindle Automatic. Dual production, for instance — the process of producing two parts simultaneously — is quickly and easily applied to a wide variety of jobs. Yes, on these jobs, as well as for hundreds of others which are so easily adapted to 6-spindle operations, peak efficiency is maintained . . . there is no lost motion . . . no time wasted . . . no spindles running idle. Tooling set-ups are easily arranged and synchronized to obtain maximum output. Attachments for the Greenlee are inexpensive, too. We suggest you thoroughly investigate the possibilities of speeding up your Victory production with Greenlee Automatics. Remember, too, with 6 spindles in one compact machine, you can save much precious floor space . . . have more room for other vital equipment. Production estimates will be gladly furnished — write GREENLEE BROS. & CO.

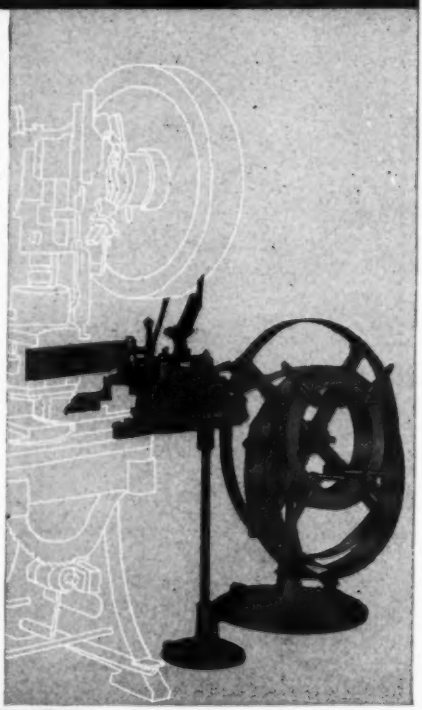
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GREENLEE BROS. & CO.

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ROCKFORD, ILLINOIS



Our Punch Presses Are More Flexible And Productive With WITTEK *Automatic* Roll Feeds And Reel Stands



Manufacturers of metal stampings facing problems in the feeding of coiled strip stock to punch presses will find that Wittek Automatic Roll Feeds and Reel Stands conserve man-hours and achieve new high production levels.

Providing an improved and simplified method of punch press operation, Wittek Automatic Roll Feeds and Reel Stands insure rapid, safe and accurate feeding under all conditions. Made in four different types to meet all automatic feeding requirements. Write for complete details. Wittek Manufacturing Co., 4305-15 West 24th Place, Chicago, Ill.

ARMY E NAVY

WITTEK WMCo. *Automatic* ROLL FEEDS and REEL STANDS

For All Makes and Sizes of Punch Presses



TO SPEED UP SLOW FINISHING JOBS!

FINISHING A BIG CASTING'S periphery or the interior surfaces of parachute buckles, Metalite Cloth belts or other specialties do war jobs swiftly and expertly; they follow contours so perfectly.

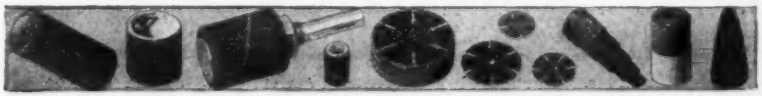
As in the illustrations above, our Abrasive Engineers adapt present machines to new work, either by slight changes or suggesting some simple attachment, to make hard finishing jobs easy, fast, economical.

They'll also demonstrate varied ingenious Metalite Cloth shapes like those below, that production men have nicknamed "Gadgets". One short demonstration on your own work and you'll be using them on high speed tools all over the shop to supplant hand finishing and other slow methods.

This helpful service is yours by simply calling our nearest branch.

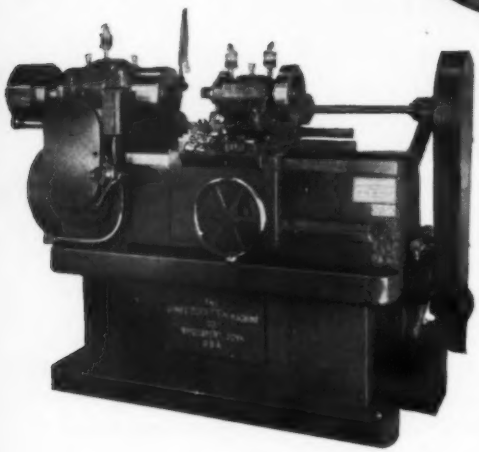
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HOB THREAD MILLER



FOR THE RAPID DUPLICATION OF RIGHT OR LEFT HAND THREADS —INTERNAL OR EXTERNAL

Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chucks, or special face plate fixtures . . . can be threaded on this machine.

Set cam-controlled automatic cycle on first piece. Thereafter, cutter feeds into work to proper depth and at correct pitch and withdraws when cut is completed. Work and cutter spindles are driven by individual motors through worm drive, affording ample power throughout the wide range of speeds and feeds.

Write for Details and Specifications.

The James COULTER Machine Co.

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SAVE TIME • MONEY • STEEL

This photo shows how Masonite Die Stock was used by Schlenzig Manufacturing Company, Philadelphia, to build a six-foot-long stabilizer rib mating die.*



MANUFACTURERS all along America's wartime production front are saving time, money and steel by using Masonite Die Stock for special types of mating dies, forming blocks, templates, jigs and fixtures.

This amazing semi-plastic material has great compressive and flexural strength . . . stands up under present-day production requirements . . . can be fabricated in pattern or metal shops with great speed.

Only one-sixth the weight of steel, Masonite Die Stock produces dies, forming blocks, jigs and fixtures that can be easily handled in and out of hydro press or power brakes, etc., by either men or women—hoists or cranes are seldom required.

Masonite Die Stock is available in thicknesses of ¼ to 4 inches . . . in sizes of 48 x 72 inches and 48 x 144 inches. For further particulars, please mail coupon below.

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MASONITE CORPORATION

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Please send me illustrative literature and complete information about Masonite Die Stock.

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PROSPECT 1666-67

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DETROIT
MICHIGAN
THREAD RING AND PLUG GAGES
AND
THREAD CHECKING EQUIPMENT

June 28, 1943

Parcell and Bauer Products Company
6016 Prairie Avenue
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Gentlemen:

Thank you for your Purchase Order No. B-7828, received by phone this morning, covering a number of different sizes of standard thread plug gages. These gages were shipped this afternoon and should be in your plant tomorrow morning.

You may be interested to know that we maintain a stock of approximately 10,000 standard thread plug gages in stock and are able to make immediate shipment on almost all sizes in National Fine or National Coarse thread series.

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Very truly yours,
CADILLAC GAGE COMPANY
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Sales Manager

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"Turn to Turchan"

THIS BOOKLET WILL TIP YOU OFF ON AN EASIER, BETTER WAY TO

Increase Production
Improve Quality
Decrease Rejects



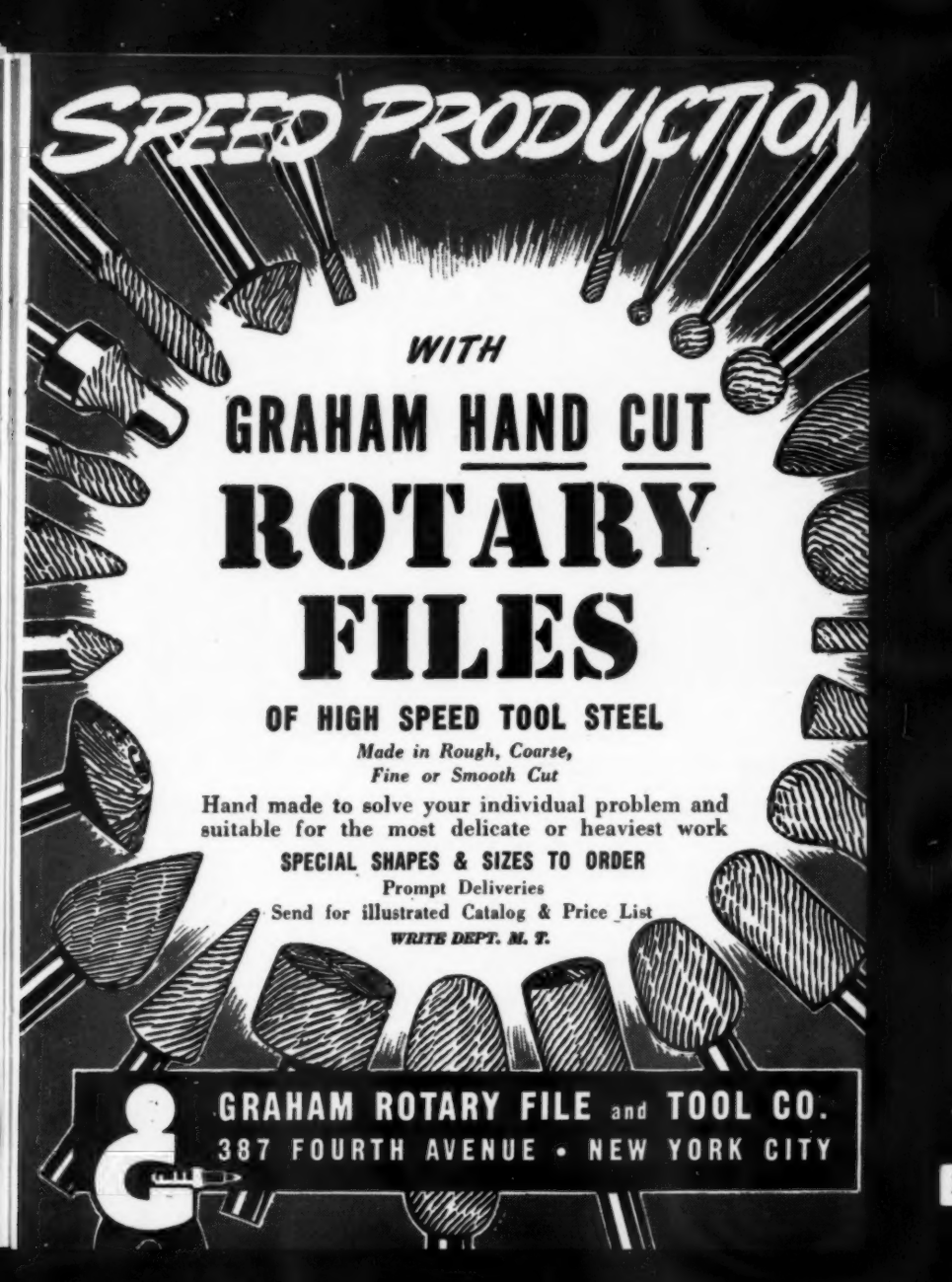
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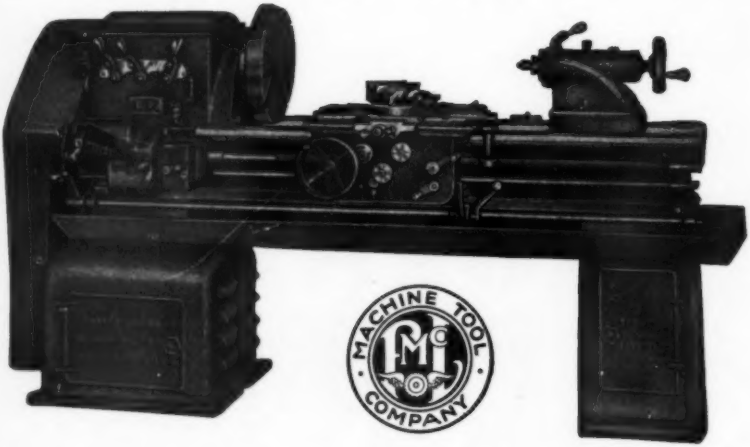
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Precision
CENTER OF CENTERS
is made for the smallest tool room lathes as well as the largest railroad shops. Severe conditions are no hazard to the accuracy and long life of the large taper thrust and annular roller bearings. Precision mounted, front bearing cone seats on resilient pad — a shock absorber protection against tool breakage. Available in taper shank, slip in, slip over and spindle types. For unconditional proof, test in your own plant.
Utility Sleeve
will cut tool costs. A saving of at least 40% (some users report 75%) with this removable taper shank tool driver. It is used with taps, drills, countersinks, reamers, end mills, center drills, counterbores, woodruff cutters, etc. The sleeve is a two jaw collet in action, fitted over the diameter of the shank of tool which is positively driven by flats or the tang on shank end.
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WITH
GRAHAM HAND CUT
ROTARY
FILES
OF HIGH SPEED TOOL STEEL
Made in Rough, Coarse,
Fine or Smooth Cut
Hand made to solve your individual problem and
suitable for the most delicate or heaviest work
SPECIAL SHAPES & SIZES TO ORDER
Prompt Deliveries
Send for illustrated Catalog & Price List
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GRAHAM ROTARY FILE and TOOL CO.
387 FOURTH AVENUE • NEW YORK CITY

Porter-McLeod

Screw Cutting Engine Lathe



16 Inch—12 Speed—Geared Head—Quick Change

Swing over bed	17"
Swing over carriage	11½"
Dist. bet. centers (6' bed tailstock flush)	36"
Dist. bet. centers (tailstock overhung)	40"
Tailstock spindle travels	5¼"
Tailstock spindle diameter	2¼"
Taper of Centers	No. 3 Morse
Front spindle bearing	Timken
Rear spindle bearing	Timken
Hole through spindle	1 5/16"
Diameter threaded nose	2 3/16"
Number of threads on same	7 per inch
Number of threads and feed changes	40
Stand. lathe will cut following threads per inch: 2, 2¼, 2½, 2¾, 2⅞, 3, 3¼, 3½, 4, 4½, 5, 5½, 5¾, 6, 6½, 7, 8, 9, 10, 11, 11½, 12, 13, 14, 16, 18, 20, 22, 23, 24, 26, 28, 32, 36, 40, 44, 46, 48, 52 and 56.	
Leadscrew threads per inch, Acme thrd.	6
Width of Belt	2½"
Steady rest opening	4½"
Driving pulley diameter	6"
Revolutions per minute	410
Highest gear ratio	42 to 1
Number of spindle speeds	12
Minimum & Maxi. speeds	15 to 500 R.P.M.
Weight on skids (6' bed)	3400 lbs.
Weight crated (6' bed)	3700 lbs.
Wt. boxed for Ocean shipments	4200 lbs.
Export boxes (6' bed)	102" x 38½" x 62"
Weight per extra foot of bed	150 lbs.
Size of tool	1¼" x ⅝"
Largest diameter held in split chuck	⅞"
Lathes furnished with 5, 6, 7, 8 and 10 foot beds.	

Engine Lathes Cold Sawing Machines Abrasive Cut Off Machines

PORTER - McLEOD MACHINE TOOL CO., INC.

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TECO CARBIDES hold cutting edges longer!

Large and small production shops using TECO Carbide Tools, consistently report more pieces between grinds, than with other tools used. Result . . . less down-time, more production.

You get more out of TECO Carbide Tools because we put more into them. TECO Carbides are harder, denser, more uniform—thus more resistant to wear and breakage. They cut at higher speeds—hold accurate tolerances for longer runs.

If you've been thinking "all Carbide tools are pretty much alike," try a run with TECO Carbide Tools and let results speak for themselves. Available in grades, styles and sizes for practically every machining need. Write for catalog giving specifications.

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TECO *Pioneers in Tungsten Carbides for over a Quarter Century* **CARBIDE TOOLS**

You can handle jobs like these faster, more accurately—at lower cost with the

SUNNEN PRECISION HONING MACHINE

Hones and finishes internal cylindrical surfaces from .185" to 2.625" in diameter—with a guaranteed accuracy of .0001". Produces a super-smooth finish of 2 to 3 micro inches.

Does not require skilled labor—in many plants girls in 'teens are handling jobs in tenths.

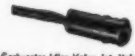
No jigs or fixtures needed—work is held in hands. Relieves big internal grinders for other jobs.

Low in cost, economical to operate. Fast—can be "set up" for any size in its range in less than a minute.

Let a Sunnen engineer check your job in your plant with this equipment—or write for bulletin giving complete information.



The coveted Army-Navy "E" waves over the Sunnen plant—evidence of the important part Sunnen equipment is playing in the war effort.



Carburetor Idler Valve Jet. Hole is honed after reaming for smooth action.



Cast Iron Valve Stem Guide. ½ to one thousandth removed—220 pieces per hour. Better finish and straighter hole.



Roller Bearing Outer Race. Finish improved from 12 micro inches to 2 micro inches.



Idle Control Valve Seat. Due to large "windows," almost impossible to get straight round hole by grinding. Sunnen solved the problem.



Bearing. A very small part. 2 micro inch finish necessary.



Hydraulic Valve. Previous method of grinding three radius on edge of "windows." Sunnen honing eliminated trouble.



Aircraft Valve Tappet Roller. Honed after grinding to give 100% bearing surface.



Hydraulic Metering Valve Stem. Hole .156" in diameter, reamed, heat treated, and then honed. Honing 3 times as fast as previous method.



Wing Bracket. Two ½" holes must be in line. Honing increased bearing surface and reamer life.



Stainless Steel Load Compensator Valve Seat. Hole is honed to .0002" limit.



Aircraft Hydraulic Brake Cylinder. Honing three times faster than lapping—and gave a straighter hole.



Hydraulic Two-Way Control Valve. Hole is honed to eliminate leakage.



Aircraft Instrument Panel Control Wire Bushing. Hole .187" diameter—held to .0002", stock removal .001", piety per hour.

Counterbore Cutter. Very small part and because of this fact hard to handle by any other method.



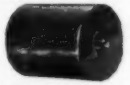
Pump Shaft Bushing, Bronze: honing follows reaming. Sunnen method greatly reduced valve leakage.



Calculator Machine Gears. Cut from hole which is reamed and then honed. Honing maintains same pitch line concentricity.



Aircraft Valve Guide. Valve tappet roller pin hole honed to 6 micro inch finish.



Header Die. Life of header dies increased 3 to 9 times over lapping. Knock out pin breakage practically eliminated.



Carburetor Metering Jet. Two black bushings Bakelite. Line honing by Sunnen method.



Spur Gear. By honing gears direct from heat treatment, concentricity of pitch line is maintained.

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Four bolts mount the Given on the machine, and various brackets are made for installation on tools of all sizes and types. 1 to 10 h.p. Givens are available. *Send for our recommendations—and ask for Bulletin and blueprints mailed free.*

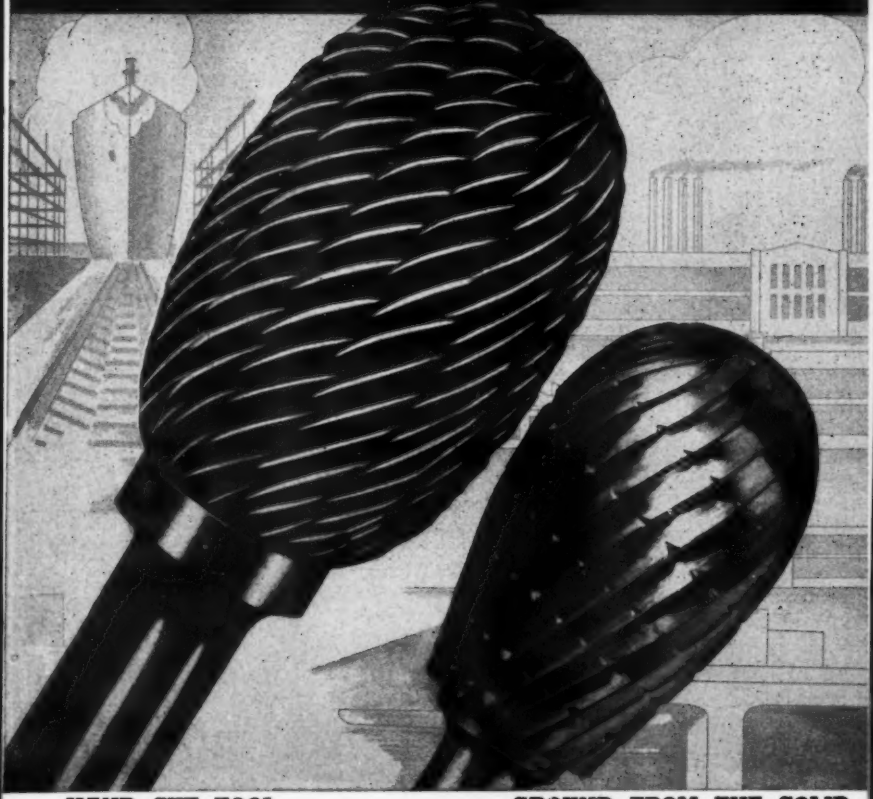


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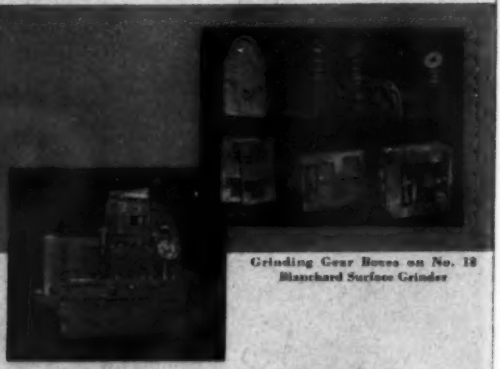
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Here is a good example of the way Blanchard No. 18 Surface Grinders are eliminating hand scraping on parts which require flat surfaces for oil-tight joints.

1/64″ of stock is removed from two sides of high strength cast iron gear boxes with oil-tight joint. Fifteen 12″ x 12″ x 3″ boxes (30 surfaces) are produced per hour.

A Blanchard No. 18 Surface Grinder with 36″ magnetic chuck and a column extended to take 18″ work is used, together with a Blanchard Sectored wheel, manufactured by The Blanchard Machine Co.

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At right is the Kellerflex JF-3 ½ H.P. all purpose machine — specially designed for toolroom or general machine shop use. For heavy duty work you merely install a $\frac{1}{16}$" cable plus a No. 2 handpiece, enabling you to run wheels as large as 6" diameter or — install a $\frac{3}{8}$" cable with the No. 1 handpiece and you may readily perform delicate work with surprising precision.

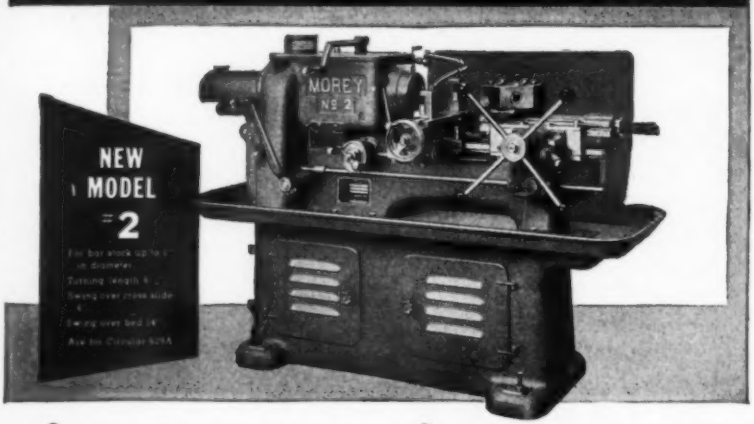
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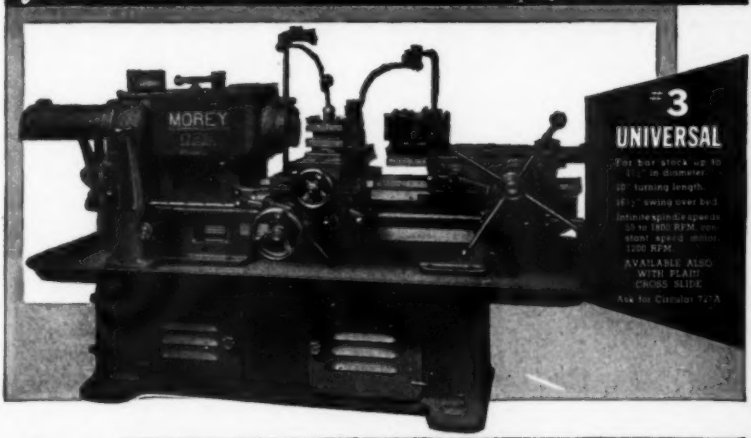


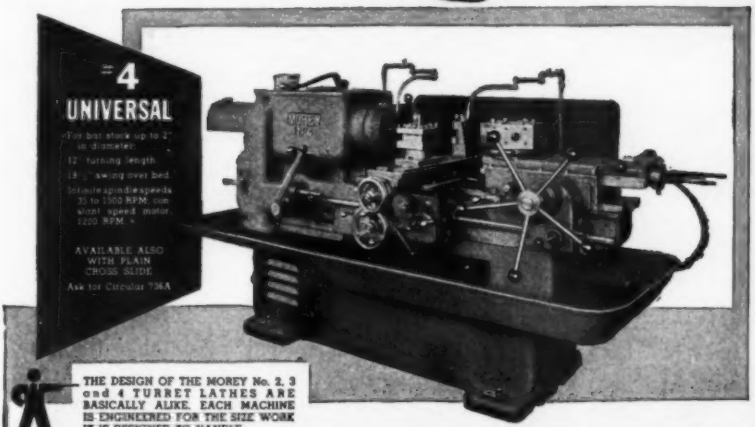
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Photos courtesy Republic Aviation Corp.

Just what gaging system you should have depends upon the set-up of your own plant. But the experience of many plants shows the value of due regard to the three features illustrated on this page.

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Determine the method best adapted to your plant which assures safe storage for gages while not at work. In the tool crib shown here, gages are replaced, and sealed in their original packages, after each job.

Adequate testing of gages, safe and convenient storage, and accurate records of their use and condition — these are the three essentials to keep in mind. Planning for these with care will pay you well in better size control of your product.

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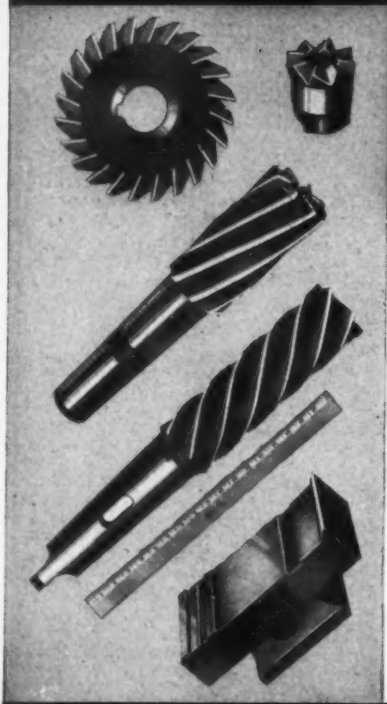
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WIX—our improved cutter flute or tooth, has a new scientific curve which promotes faster cutting and also lengthens the useful life of the tool. Ask us about it. Our new Bulletin sent on request.

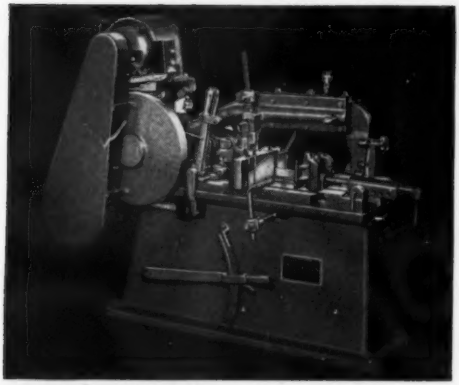
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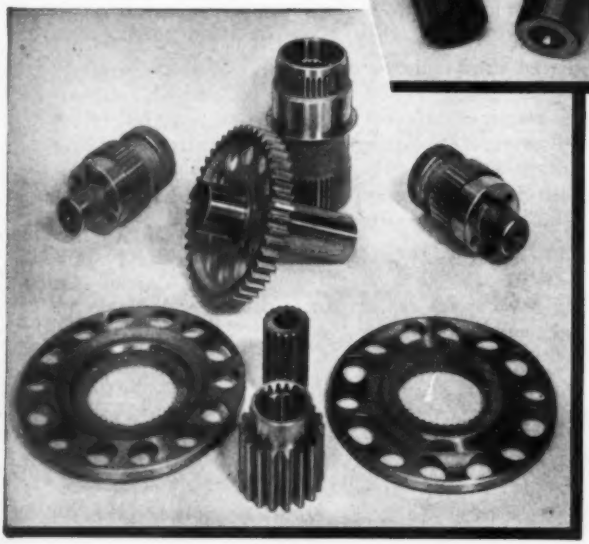
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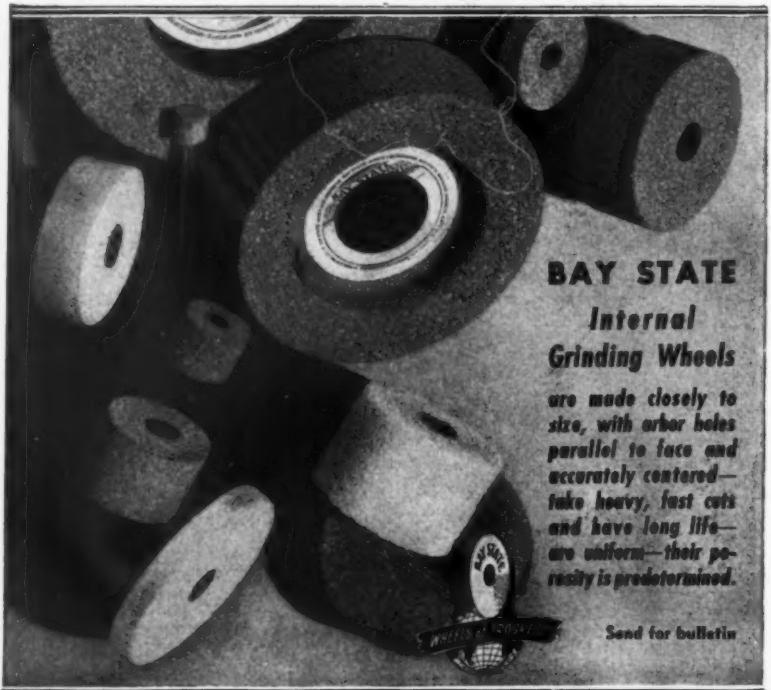
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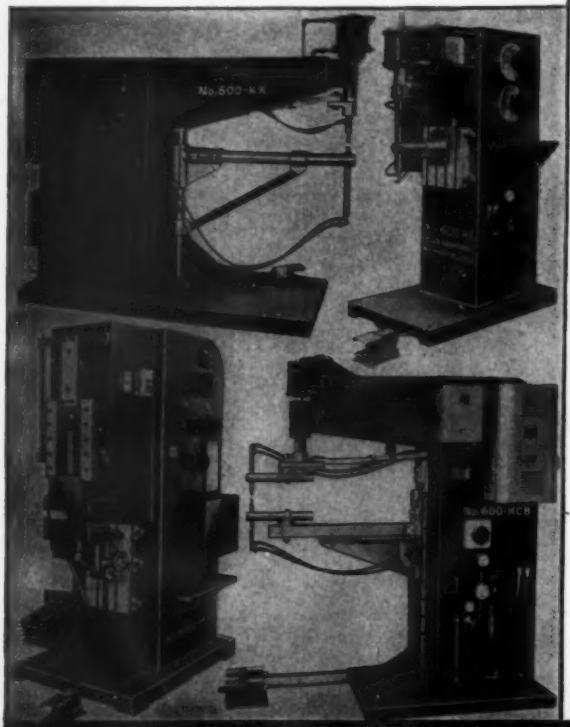
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State Frame Model and Frame Size. Stipulate whether gage is to be set and sealed (allow additional day on orders for set and sealed gages). Give complete marking instructions if set and sealed.

FOR SPECIFICATIONS SEE SHEFFIELD HANDBOOK No. 42-2 PAGES 150-153

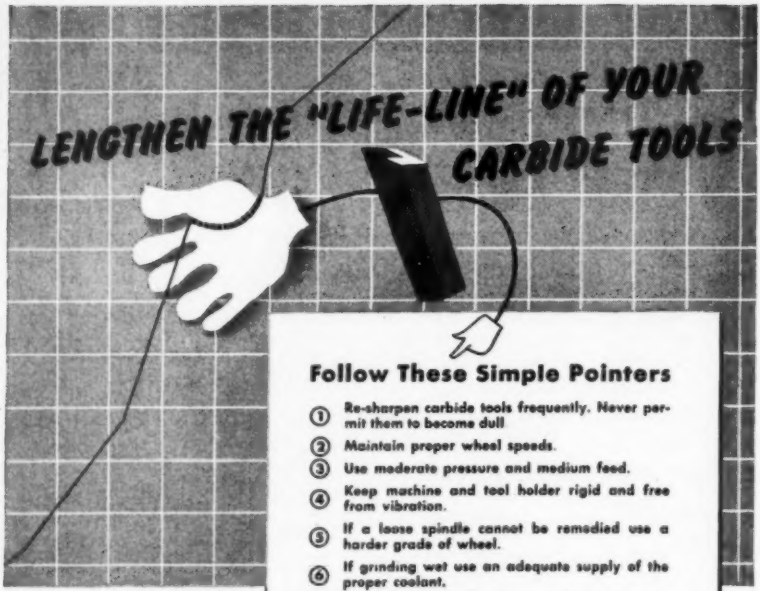


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Follow These Simple Pointers

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2. Maintain proper wheel speeds.
3. Use moderate pressure and medium feed.
4. Keep machine and tool holder rigid and free from vibration.
5. If a loose spindle cannot be remedied use a harder grade of wheel.
6. If grinding wet use an adequate supply of the proper coolant.
7. If grinding dry do not over-heat the carbide tip
8. Never cool a carbide tip by immersing it in water or other coolant.



9. USE MID-WEST "B" BOND WHEELS FOR ALL CARBIDE TOOL GRINDING.

MID-WEST engineers will be glad to help you select exactly the right "B" Bond wheels for your grinding room. MID-WEST "B" Bond wheels are manufactured in any grain and any grade, porous or dense. Reasonably prompt delivery

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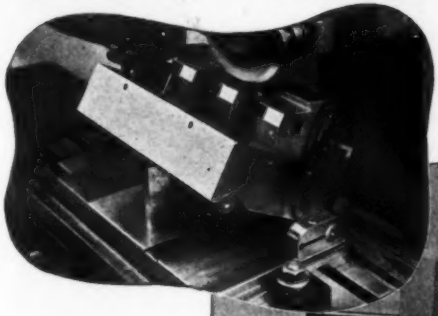
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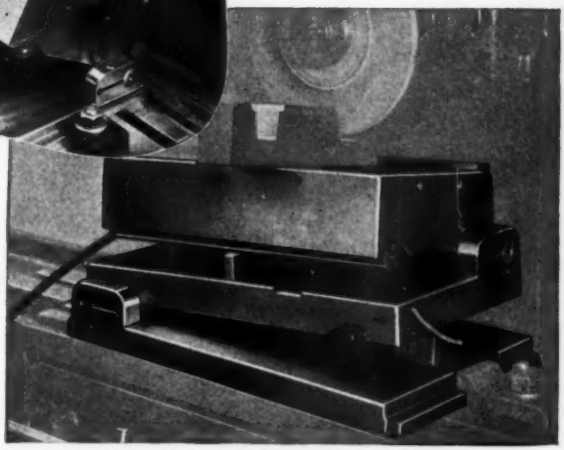
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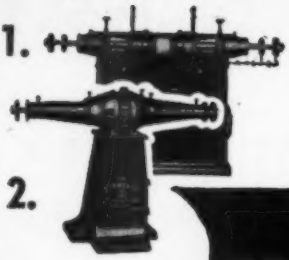
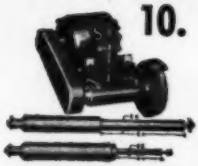
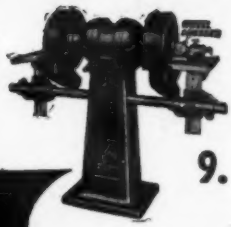
With Magna-Sines in use for your angular grinding operations, hours of set-up time can be saved and work is completed to the closest possible accuracy. There are no screws or nuts to tighten or loosen . . . no clamps are required . . . magnetic efficiency is guaranteed.

Two sizes are supplied in both compound and single angle models. Non-magnetic models are also available for inspection purposes.

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CINCINNATI • OHIO

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Amazing speed for continuous production on cut-off work. Faster — as Band Saw cutting has no heat generation — no drag or inertia to overcome — and practically no speed limitations.

Smooth — accurate — quick, easy set-up — moderate cost. Pays for itself on savings in time — labor — depreciation — power and tool steel.

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STANDARD MODEL FOR INTERMITTENT SERVICE. (Coolant can be added at any time.)

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DO YOUR PART FOR THE MEN AT THE FRONT

WITH R AND L TOOLS





R and L—the *time saving* turning tool is the answer. It will do the work of 14 different tools now being used in your shop.

It can be changed from right to left or left to right in 10 seconds. The only tool on the market of its kind.

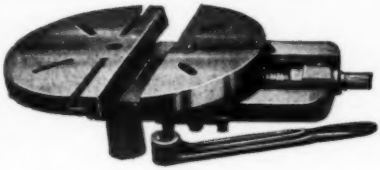
No wasted time in set-up; performs many operations at once, such as: turning shoulder concentric with stock diameter; turning two diameters while drilling or reaming; turning one diameter-chamfering two corners, facing end of part along with drilling or reaming; turning and forming special shape or end of part while drilling or reaming; drilling and chamfering; pointing work concentric with turned diameter. ***Write for detailed information.***

R AND L TOOLS

1827 BRISTOL ST., NICETOWN, PHILADELPHIA, PA.

Use the COMBINATION

DRILL TABLE and VISE



SPEEDS DRILL PRESS SET-UPS

Simplifies the most difficult set-ups. Holds work of all shapes securely, without angle plates, clamps or supports. Just drop in the work and start to drill.

The Combination is made in various sizes — diameters from 8" to 27½", weighing from 27 to 600 lbs. Made of the finest materials, for long life. Easy to install. Specify shank diameter in thousandths of an inch. We supply the drill table and vise with shank turned to size specified.



GUARANTEE

We guarantee the Combination will save its cost in labor alone in six months. You are the judge.

FREE TRIAL

We will ship to rated concerns under this guarantee, on free trial. Should you decide not to keep the tool we will even pay return transportation. Order Today!

Circular on Request.

WRITE TODAY FOR CIRCULAR

Gives full information and illustrates typical, set-ups. Shows use on radial drills. Complete specifications of all models including the square, all steel tables.

MODERN MACHINE TOOL CO.

Jackson, Michigan

GRINDALL

EXTERNAL GRINDER
INTERNAL GRINDER
MODEL B—6" x 12"

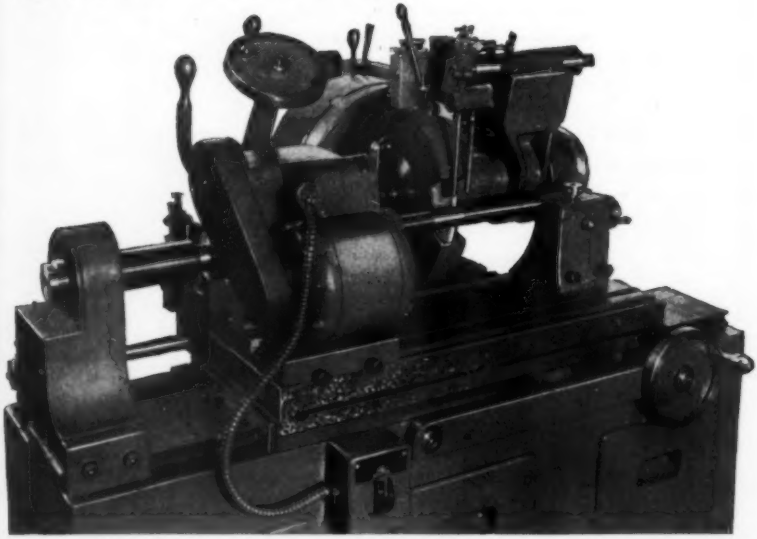
THREAD GRINDER

Tool and Production executives from everywhere, from Maine to California, and from foreign countries have come to our plant to see this thread grinder in operation.

After seeing the accurate work it produces, the simple foolproof and ingenious design and the high rate of production of this thread grinder, they have ordered from one to several machines.

The accuracy of the GRINDALL thread grinder is unsurpassed.

It can be set up for any thread grinding job internal or external in ten minutes. It is simple in design and operation and anyone who can measure accurately can learn to operate the machine and be thoroughly familiar with it in a few hours.



GENERAL MACHINE TOOL CO. **SENECA FALLS, NEW YORK**

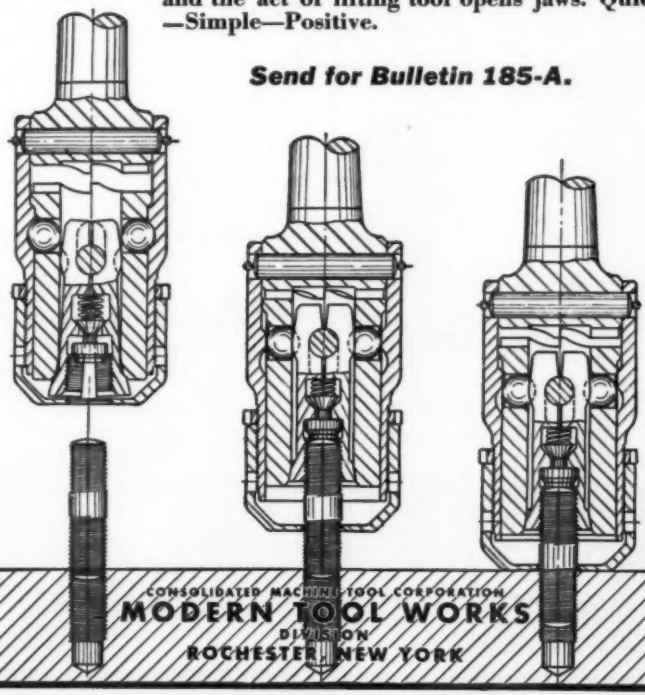
REPRESENTATIVES IN ALL PRINCIPAL CITIES

SPEED-UP YOUR STUD SETTING WITH

MODERN SELF-OPENING STUD SETTERS

The 3 steps in setting studs with a Modern Self-Opening Stud Setter are: At left, Jaws open to take stud; middle, driving position, jaws locked on Stud, At right, Stud driven to full depth, stop collar contacts work. releases clutch - and the act of lifting tool opens jaws. Quick —Simple—Positive.

Send for Bulletin 185-A.



CONSOLIDATED MACHINE TOOL CORPORATION

MODERN TOOL WORKS

DIVISION

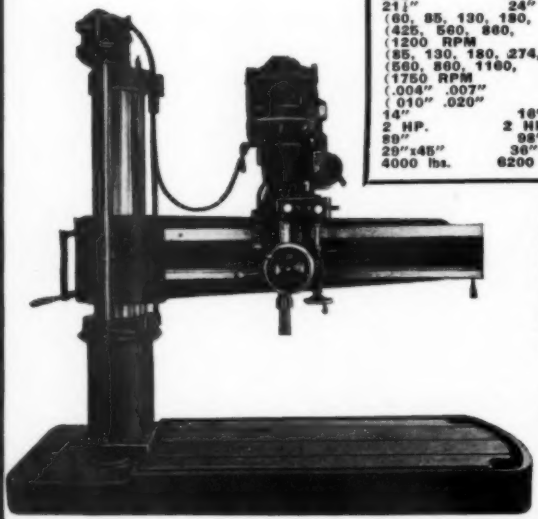
ROCHESTER, NEW YORK

CANEDY-OTTO
RADIAL DRILLS

USED THE WORLD OVER

SPECIFICATIONS:

	9" Column 3' Arm	11" Column 4' Arm	11" Column 5' Arm
Drills to the center of circle on base or table	73½"	96"	120"
Length of arm	3"	4"	5"
Greatest distance from spindle to base	43½"	48"	48"
Minimum distance from spindle to base	9½"	15"	17"
Minimum distance from spindle to column	10½"	10"	10"
Traverse of spindle	9½"	9½"	9½"
Hole in spindle—Morse Taper	No. 4	No. 4	No. 4
Diameter of spindle at nose	2½"	2½"	2½"
Traverse of head on arm	25½"	36½"	48½"
Traverse of arm on column	21½"	24"	22"
Spindle speeds with 1200 RPM motor	(60, 85, 130, 180, (425, 560, 860, (1200 RPM		on all models
Spindle speeds with 1800 RPM motor	(85, 130, 180, 274, (560, 860, 1160, (1750 RPM		on all models
Feeds per revolution of spindle	(.004" .007" (.010" .020"		on all models
Bearing of arm on column	14"	16"	18"
Size of main driving motor	2 HP.	2 HP.	2 HP.
Height of drill column over gears	89"	98"	98"
Working Surface of Base	29"x45"	36"x60"	36"x88"
Net weight	4000 lbs.	6200 lbs.	7000 lbs.



Canedy-Otto has been the manufacturer of first-class, high-grade drilling units since 1892. These units are available in single spindle, multiple spindle and radial.

We can help you solve your drilling problems. Send for information on our complete line.

Early delivery possible.

CANEDY-OTTO MFG. CO.
CHICAGO HEIGHTS, ILLINOIS

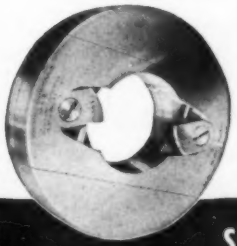
Lo-swing IMP LATHE

A Small Automatic Capable of High Speeds, Fine Finishes and Extreme Accuracy



● The IMP is intended primarily to handle work demanding high speeds (up to 5000 R.P.M.) and extreme accuracy, but its sturdy, compact design makes it likewise suitable for turning heavier work such as small pistons, bushings, gear blanks, etc. It incorporates such modern features as: Seneca Falls built-in *Change-Over Mechanism;* positive operation of Third Slide and Back Attachment by self-contained drum cam; anti-friction bearings, and automatic lubrication to all bearings including carriage ways.

The *Lo-swing* Imp, because of its integral unit design, lends itself to practically unlimited tooling possibilities. Two types of heads are available depending upon spindle speed required. A geared head i used for lower speeds and direc drive for higher ranges. A Third Slid or Over-arm for additional facing grooving or chamfering operation —either roughing or finishing—ca be furnished. Automatic work han dling devices are frequently use with this machine.



SENECA FALLS *Automatic* WORK DRIVER

Self Centering... Quick Acting... No Slip. Attaches to any chuck plate or spindle. Provides a positive, balanced drive which reduces chatter. Handles rough forgings or turned pieces — straight or taper. Eliminates dogging time. Reduces tool breakage. Write for details and size range.

SENECA FALLS MACHINE CO. SENECA FALLS NEW YORK

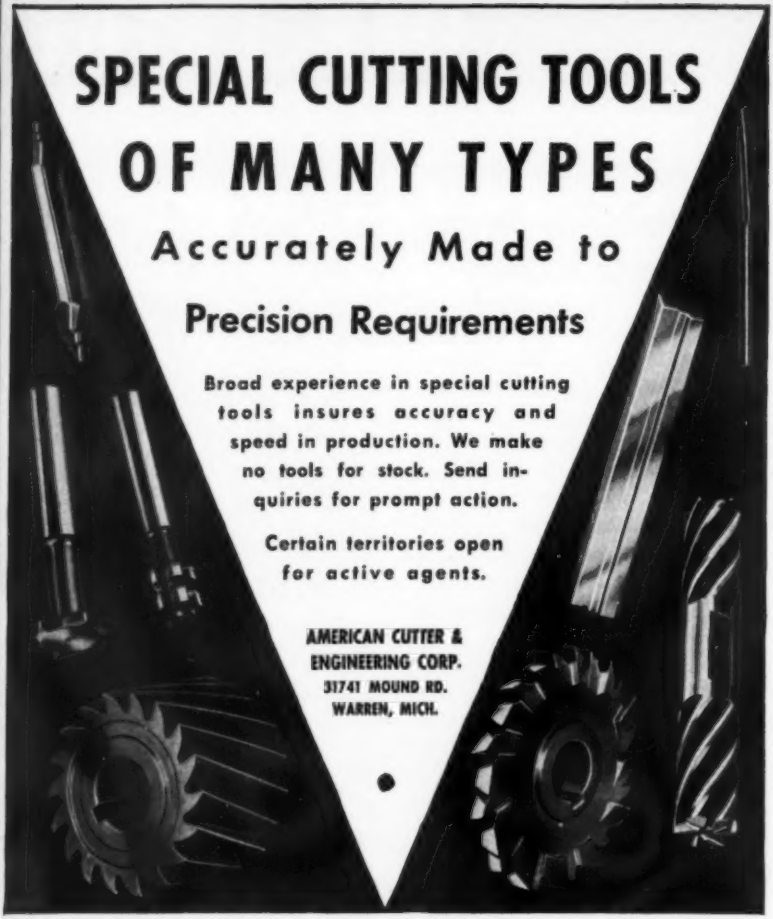
SPECIAL CUTTING TOOLS OF MANY TYPES

Accurately Made to Precision Requirements

Broad experience in special cutting tools insures accuracy and speed in production. We make no tools for stock. Send inquiries for prompt action.

Certain territories open for active agents.

AMERICAN CUTTER & ENGINEERING CORP.
31741 MOUND RD.
WARREN, MICH.



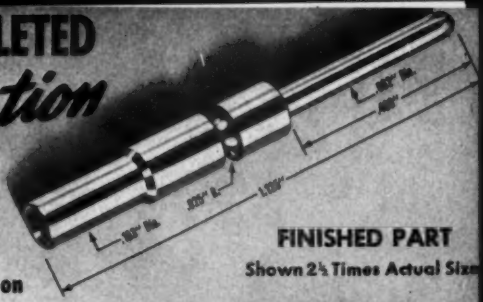
AMERICAN CUTTER

AND ENGINEERING CORP., WARREN, MICH.

SPECIALIZING IN HIGH SPEED CUTTING TOOLS TO YOUR PRINTS

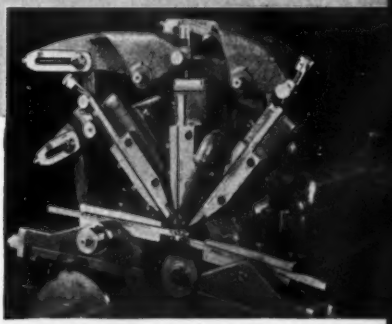
THIS PART COMPLETED *in One Operation*

IN LESS THAN 9 SECONDS



FINISHED PART
Shown 2½ Times Actual Size

Tolerances Held Within ± .0005 on GORTON 16-A Precision AUTOMATIC



The 5 actual cutting tools used to produce this job, shown in position on the Gorton 16-A 5-Station Multiple Tool Head.

The accurate, high speed production of this precision part is simple and highly efficient on the Gorton 16-A. Only this tooling is required: 6 cams, 5 cutting tools, one drill, 2 collets and one bushing. Drilling of hole is accomplished with attachment mounted ahead of cutting tools..

Tolerances on all dimensions are held within ±.0005"; extremely high finish is maintained. Seven pieces are produced per minute with spindle speed of 8700 r.p.m. and surface speed of 290 f.p.m. Material is ⅛" round free-cutting brass.

IN 1 OPERATION
TURNS, CENTERS, DRILLS, THREADS, SLOTS

The Gorton 16-A mass-produces an almost endless variety of short or long slender parts—simple or complex—complete in *one* operation. It does step and contour turning and chamfering in multiple diameters—tapers, knurls, bevels, back recesses, pivot points, etc.

Extreme accuracy and unusually high finish are maintained; second operations often eliminated. Maximum accessibility of all vital parts and controls insures simplicity of set-ups and operation.

George Gorton Machine Co.
1317 Racine Street, Racine, Wisconsin, U.S.A.



WIDE RANGE OF WORK
SMALLEST .005" dia. by 1/32" long
LARGEST 1¼" dia. by 2¾" long

GET THE FACTS NOW

Mail Today for FREE Bulletin

GEORGE GORTON MACHINE CO.
1317 Racine St., Racine, Wis.

Send me, without obligation, FREE bulletin with complete information covering the Gorton 16-A Precision Automatic Screw Machine.

Name.....*Title*.....
Company.....
Address.....
City.....*State*.....

OUR GOLDEN ANNIVERSARY 1893-1943



GEORGE GORTON MACHINE CO.
1317 RACINE STREET, RACINE, WISCONSIN, U.S.A.

More production per worker!



FOOT CONTROL LEAVES BOTH HANDS FREE TO WORK!

Features: *Vise opens and closes instantly . . . Remains open or closed without constant foot pressure . . . Exerts grip of 15 times air-line pressure . . . Measures 12 x 6 ½ x 6 in. . . . Jaw width 3 in. . . . Jaw depth 2 in. . . . Maximum opening 3 in. . . . Maximum travel ½ in. Attaches to air line or individual compressor.*

SPEEDY AIR VISE
complete with Foot Control Valve, Air Hose and Fittings . . **$24**

Want more production? Follow the example of leading war plants — put *Speedy Air Vises* to work! This foot-controlled, pneumatic vise leaves operator's both hands free for safe, fast insertion and removal of work. You'll find it cuts time, labor and costs, reduces fatigue. Sturdy, compact, precision-built . . . so low in price it can be economically used on every drill-press, miller, filer and assembly line. Prompt delivery. Ask your distributor or write for details.

W. R. BROWN CORP. 5724 ARMITAGE AVE. CHICAGO, ILL.

AMERICA'S MOST TALKED-ABOUT VISE . . . AT A PRICE!



Combine AIR-CONTROL ACTION AND GET *Plus Value!*

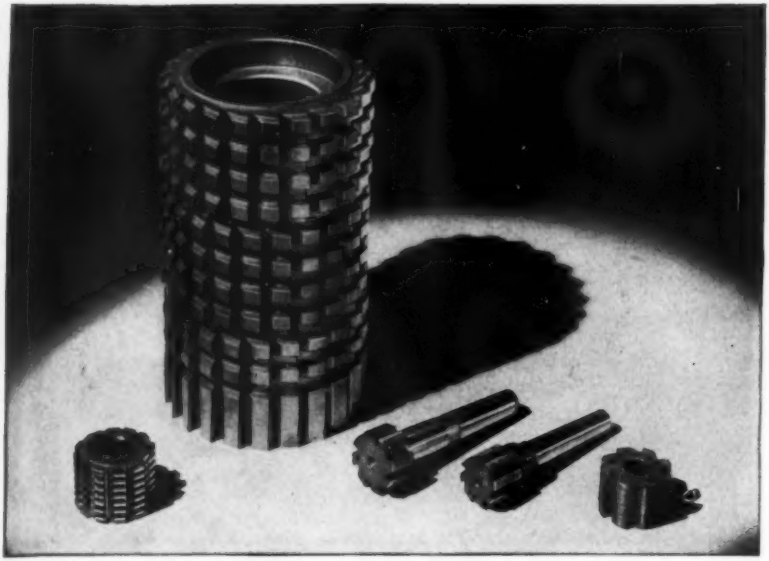
Why use four separate units when one can do the job *better,* and *more economically?* The Marton Air Control Unit *combines* a Pressure Regulator, Gauge, Control Valve, Lubricator and Filter right in its neat, space-saving construction!

This means the extensive pipe fittings of separate units is not necessary. And a Marton Air Control Unit is easily adjusted, simply maintained, completely accurate! Serves a variety of uses—adjustable for one-way operation, or special requirements.

For full information, write Ellwood L. Houtz, Agent, 93 Hale Street, Beverly, Mass.

SMALLPEICE LTD. MFG. IN U.S.A. & GREAT BRITAIN

PLAN-O-MILL



THREAD MILLING CUTTERS

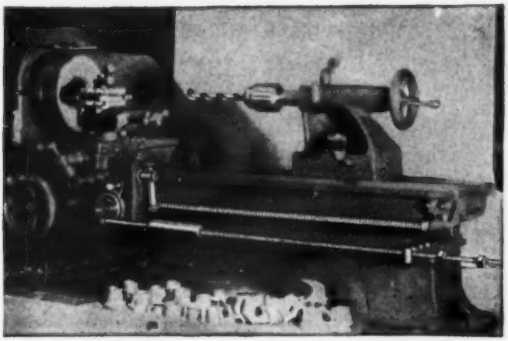
Years of on-the-job experience—working with production men all over the country as each Plan-O-Mill milling machine was tooled for another job—told Plan-O-Mill engineers exactly what was needed for accurate, economical thread milling.

The result is the Plan-O-Mill Multiple Thread Milling Cutter, now proving its worth in factories and machine shops from coast to coast.

Plan-O-Mill Thread milling cutters are available ground or unground with straight or spiral flutes, in National, Whitworth, Acme, V, and special forms, for use on all types of thread milling machines. For speedy delivery give full details when ordering, including size of cutter; thread form, pitch, and direction; straight or spiral gash, and job description.

MILLING MACHINES PLAN-O-MILL MILLING CUTTERS

PLAN-O-MILL CORPORATION, 1511 E. Eight Mile Road, Hazel Park, Mich.



MAKES LATHE WORK SIMPLER AND FASTER!

AMERICAN *Automatic* LATHE STOP GAUGE

PATENT PENDING

This new attachment accurately sets the length of travel of the lathe carriage for one or more cuts so that duplicate pieces can be made on a mass production scale. Once a stop is set, every piece of work will receive a cut of identical length with unfailing accuracy. The gauge stops the carriage only; it does not shut off the lathe motor or power feed.

- **INCREASES PRODUCTION**
- **CUTS SET-UP TIME**
- **REDUCES REJECTS**
- **PREVENTS ACCIDENTS**
- **PERMITS USE OF SEMI-SKILLED LABOR**
- **EASILY ATTACHED**

MODEL AL-2 — for 24" centers. Prices on other sizes furnished on request. **$9.25**

Quickly installed on Logan, Atlas, South Bend, and other make lathes. When ordering, specify make and model of lathe, swing and distance between centers.

DEALERS' INQUIRIES INVITED

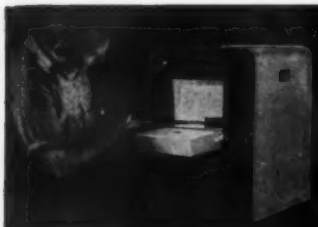
Can Be Used 3 Ways:

1. **AUTOMATIC**
2. **SEMI-AUTOMATIC**
3. **MANUALLY**

SCHULTZ & ANDERSON CO.

109 EDISON PLACE, NEWARK, N. J.

MANUFACTURED BY THE AMERICAN PRODUCTS CO.



Heat Treat Your Own Small Parts...

SAVE TIME AND MONEY THESE 5 DIFFERENT WAYS

This small compact electric furnace is inexpensive, handy and easy to operate—ideal for small tool and die shops—saves time these five different ways:

1. Eliminates delays in sending small machine parts out to overcrowded commercial heat treaters.
2. Saves time and expense of drawing or tempering small metal parts in large furnaces.
3. Cuts handling time when normalizing or annealing small parts. No waiting.
4. Conveniently available for pre-heating for subsequent high-speed hardening.
5. Eliminates shut downs and delays in servicing emergency repair orders.

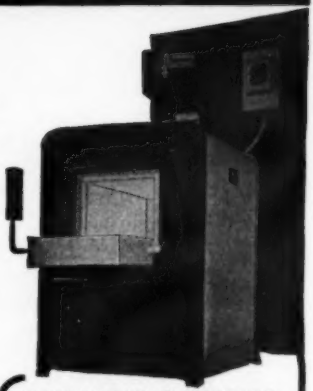
AVAILABLE IN TWO SIZES

Type	*Chamber Capacity*	*Amps 115 V*	*Watts*	*Amps 230 V*	*Price*
MH-3	8"W 6"H 14"L	29.6	3400	14.8	$124.00*
MH-4	10"W 6"H 18"L	....	4800	20.9	$191.00*

**Includes Hearth Plate*

MAX. SAFE TEMPERATURE—Continuous operation, 1750° F.; Intermittent operation, 1850° F.

AUTOMATIC CONTROL—Indicating Controlling Pyrometer—Thermo-couple and lead wire complete—$152.40.



REPLACEABLE HEATING ELEMENTS—Replaceable nickel chromium resistors embedded in rectangular refactory blocks. Elements form inner walls of furnace chamber, and may be replaced easily and quickly after removing rear panel—furnace structure remains undisturbed.

FREE Complete data covering specifications, additional applications and ordering instructions are included in this new folder. Write for your copy today. Ask for Bulletin No. 50.



COOLEY ELECTRIC MANUFACTURING CORP.
213 S. SENATE AVENUE • INDIANAPOLIS, IND.



Hob Size ⅜" x ½" x .315"

BARBER-COLMAN SMALL FINE-PITCH HOBS

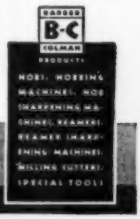
...TO 200 D. P. GROUND...TO 250 D. P. UNGROUND

UNTIL a few years ago, the production of accurate small gears and pinions, having teeth spaced from .007" to 050" apart, required that the teeth be cut one at a time. No production tools were available. In recent years, however, Barber-Colman Company has perfected the manufacture of fine-pitch hobs for work of this class. Now the field of small gear manufacture is able to enjoy the advantages of rapid continuous hobbing production, accurate gear tooth profiles, reproduction of identical forms, and minimized tooth to tooth errors. Hundreds of thousands of tiny gears and pinions are now used in mechanisms where the gearing must be quiet, smooth running, interchangeable, and able to operate properly under all conditions. Many of these are in the intricate war machines that are so important to us today. When it is considered that the tooth forms and clearances required on hobs used for producing these parts are measured in terms of ten-thousandths of an inch, the ability of Barber-Colman tool craftsmen to maintain close limits of accuracy on these hobs is all the more significant. The complete story of this extraordinary development is told in our new book "Facts About Small Fine Pitch Hobs". If you do not already have a copy, write for one today and learn what these hobs can do and how to use them properly and to best advantage.



Buy War Bonds

CUTTING TOOLS ARE SCARCE
MACHINES CAN'T RUN WITHOUT THEM
CONSERVE WHAT YOU HAVE

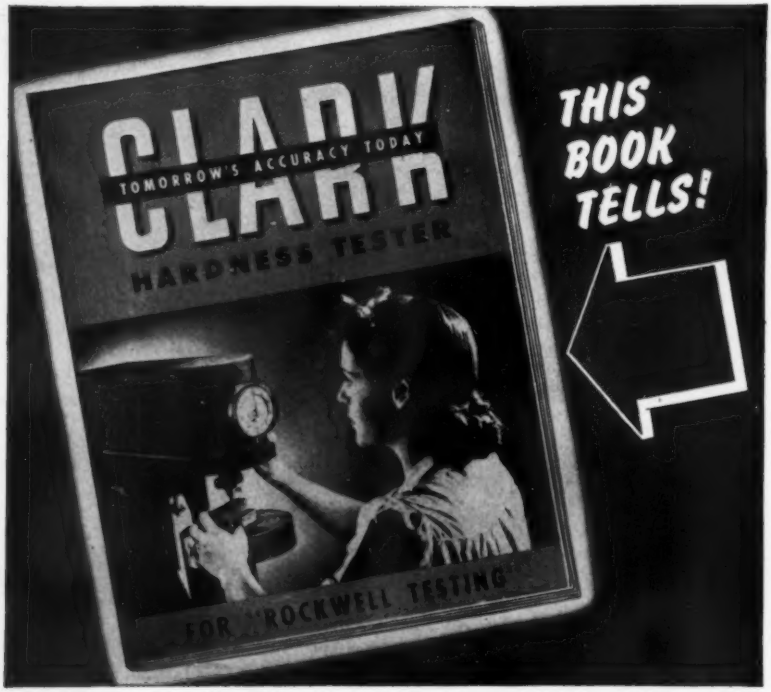


Barber-Colman Company

GENERAL OFFICES AND PLANT • 207 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

DO YOU KNOW THE TRUTH

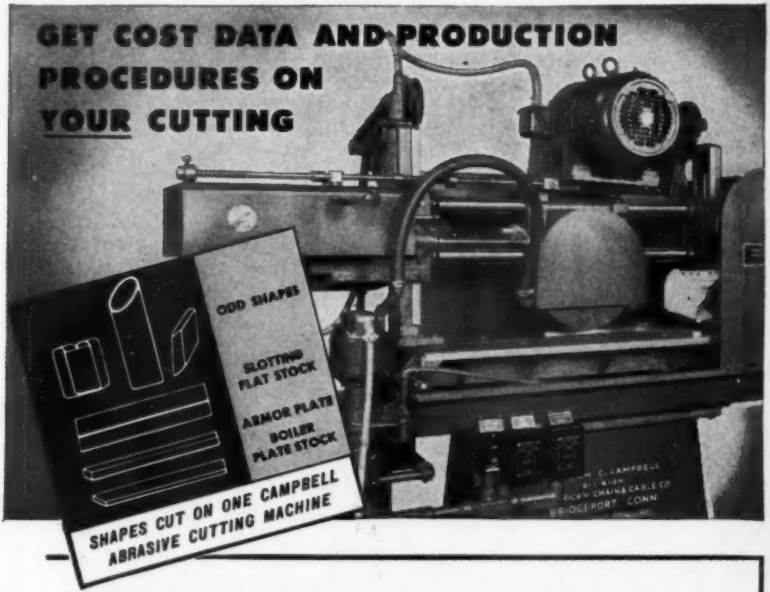
About Hardness Testing?



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TOMORROW'S ACCURACY TODAY
HARDNESS TESTER

The new Clark catalog is more than a catalog.

It is a 20-page reference manual on the history, theory, practice, and equipment for modern, scientific hardness testing. Printed in two colors, size 8½"x11", it is available without charge to manufacturing executives. Just drop a line on your letterhead to Department BB, CLARK INSTRUMENT INC., 10200 Ford Road, Dearborn, Michigan.



● Campbell engineers have provided many manufacturers of note with cutting programs that have opened the way to new highs in production and lows in the cost of cutting. These programs have proved sound—based on the practical experience of the Campbell complete line of Abrasive Cutting Machines—the only complete range of cutting machines.

Currently, **CAMPBELL ABRASIVE CUTTING MACHINES** are being used on all grades of steel, annealed and unannealed; non-ferrous alloys; plastics; glass and ceramics. They are cutting solid bar, tubular and flat stock.

To get the cost data for your company, write the Campbell Engineering Department. State what materials you cut, shapes, sizes, length before cutting, lengths of cut-off pieces and production required per hour. No obligation.

Campbell

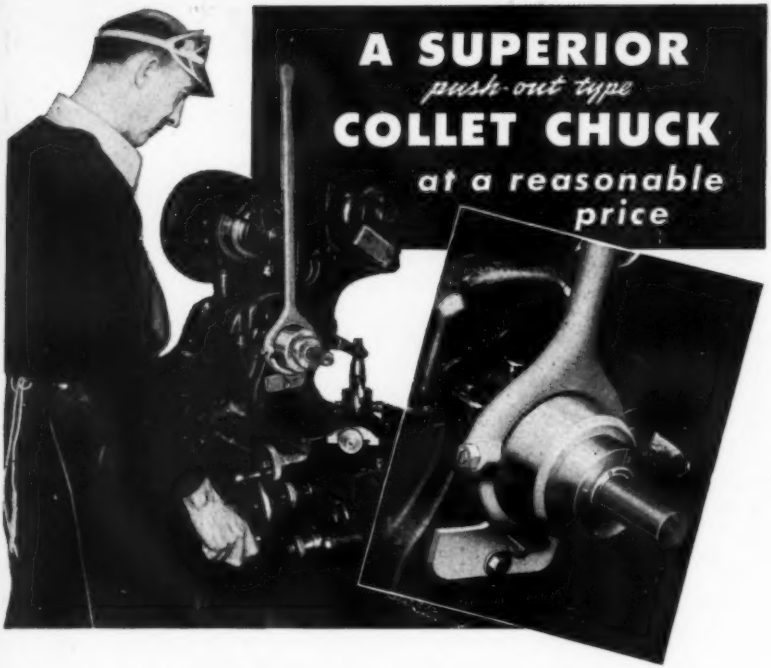
ABRASIVE CUTTING MACHINES

ANDREW C. CAMPBELL DIVISION • **Bridgeport, Connecticut**

ALSO MAKERS OF A COMPLETE LINE OF NIBBLING MACHINES

AMERICAN CHAIN & CABLE COMPANY, Inc.

BRIDGEPORT • CONNECTICUT



Powerful grip locks stock in chuck—automatically adjusts itself to varying stock sizes ★ A hand slap locks and unlocks with lathe running ★ Grip and leverage to spare ★ Full spindle capacity ★ No wrenches, keys or special tools ★ Designed for working modern high alloy steels with women operators ★ All parts turn at spindle speed except floating shoes ★ No friction, no heat, no lost power ★ Assures precision work on a production basis.

Order Now with Proper Priorities

hall MANUFACTURING COMPANY

622 Tularosa Dr. Phone NOrmandy 9679 Los Angeles 26, Calif.

NEW! WET-CUTTING MODEL
FOR ULTRA HIGH SPEED METAL CUTTING
JOHNSON
METAL CUT-OFF BANDSAW



Dry-Cutting Model Also Available

CAN ALSO BE ADAPTED TO EXISTING JOHNSON DRY-CUTTING BANDSAWS

The Johnson Coolant Model offers unusual advantages for production requiring exceptionally high-speed . . . on some jobs increases as high as 200% can be attained . . . Longer blade life assured!

★ NO SEPARATE MOTOR REQUIRED — one power source does cutting and operates coolant pump. No special wiring or switches necessary.

★ COOLANT FLOWS AUTOMATICALLY — Machine speed controls flow of coolant in direct proportion to speed of blade.

★ BLADE WIPERS remove coolant after cutting; no danger of bearing lubricants.

★ PUMP SHAFT runs on bronze bearings, quietly, efficiently; handles any cutting fluid.

★ DRY CUTTING may be handled by simply disconnecting pump.

JOHNSON MFG. CORP. ALBION, MICH.

Write today for descriptive literature to

SALES OFFICE, 5006 CHRYSLER BLDG., NEW YORK



Side grinding teeth within limits of .00025"

CIRCLE "R" Metal Cutting Saws

Made by Perfectionists



Also Combination Drills and Countersinks and Reamers

CIRCULAR TOOL CO., Inc., Providence, R. I.

CHICAGO · PHILADELPHIA · NEW YORK · DAYTON · CLEVELAND
SYRACUSE · INDIANAPOLIS · DETROIT · ST. LOUIS

Improved DETACHABLE Air-O-chek LEAKPROOF AIR GUN

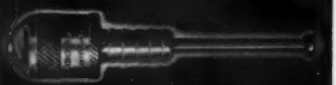


featuring

1. Ball and socket joint between valve and enclosed lever. This exclusive AIR-O-CHEK feature gives full air discharge with slight flex of hose and instant, positive shut-off when hose is released. Also eliminates packing gland and external levers or buttons.

2. The long ferrules formed over special shoulders on valve and fitting reinforce union with hose and seal end of hose against grease or oil.

3. Factory assembly on hose of special quality and weight assures easy operation and long troublefree service.



Model A AIR-O-CHEKS for assembly direct on the hose can also be furnished in a wide range of sizes.

For leakproof performance, dependability, and low maintenance, AIR-O-CHEK Air Guns have long stood alone. This unqualified supremacy is made possible by the ball and socket joint connecting the enclosed lever to the valve—an exclusive AIR-O-CHEK feature found in no other air gun or blow gun.

In addition, the new Model FA Detachable AIR-O-CHEKS bring the streamlined security of special ferruling, combined with easy operation assured by correct assembly on hose of the proper weight and quality.

AIR-O-CHEKS are precision machined from bar brass and stainless steel. Made in types and sizes for all requirements. Write for Catalog.



Standard Model FA AIR-O-CHEK. Furnished with ⅛", ¼" and ⅜" female pipe thread.



Jewelers' Model FA AIR-O-CHEK. The favorite of women war workers because of small size, light weight and easy operation.

AIR-WAY PUMP & EQUIPMENT COMPANY, 401 S. Jefferson St., Chicago, Ill.

FOUND.. *A New Way to Lower* WHEEL DRESSING COSTS!



TRU-THREAD DIAMOND DRESSING TOOL STEPS UP THREAD GRINDING PRODUCTION

Examine this new TRU-THREAD diamond dressing tool by Wheel Trueing Tool Company, Inc. You'll see the latest development of an organization that has spent 33 years designing, developing and building diamond tools of fine quality.

You'll see a diamond dressing tool that is setting new records of speed and economy—one that can boast production increases as high as 500% and reductions in per piece grinding costs up to 75%.

How is this possible? Wheel Trueing engineers have found a way of utilizing the hard characteristics of the natural uncut diamond—never before thought possible in tools of this type. The result is a tool that cuts cleaner—obtains forms faster. Forms hold longer. Fewer dressings are required. More work can be ground between dressings. Down time is reduced. And this tool can be made and reserviced on a production basis, assuring quick deliveries.

You'll learn many other advantages of TRU-THREAD TOOLS once you put them to work on your thread grinding machines. *Write or wire for further information today!*

DIAMOND TOOLS for

Straight, form, thread and radius dressing, turning, boring, gaging, and core drilling

WHEEL TRUEING TOOL COMPANY INCORPORATED

3200 W. DAVISON DETROIT 6, MICH.

SHAPE-RITE SHAPERS *are known the world over for their excellent performance*



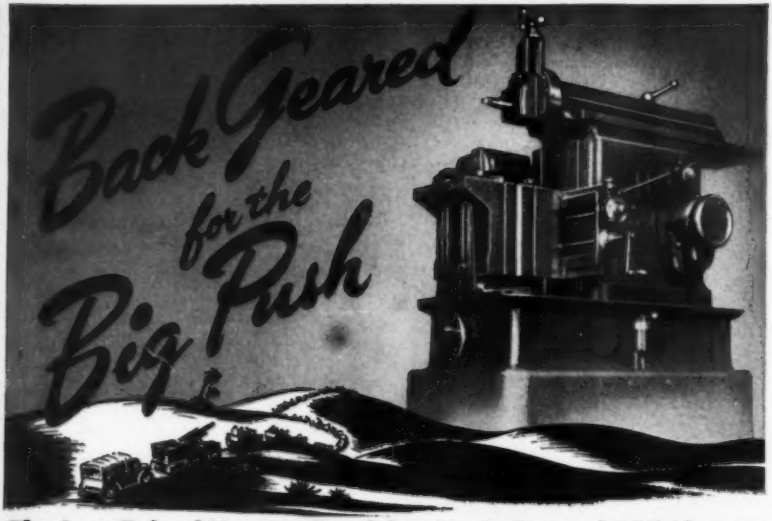
Why wait for post-war days for improvement? Investigate the new improved MODEL B SHAPE-RITE *before you buy a* SHAPER.

You will note such features as all gears are cut on helical angle and are mounted on anti-friction bearings. All gears, except the bull gear, are totally enclosed and run in oil. The controls are mounted conveniently within the reach of the operator, plus many other outstanding features.

The 8" stroke Shape-Rite is the biggest and finest 8" shaper in the world.

Sales Service Machine Tool Co.

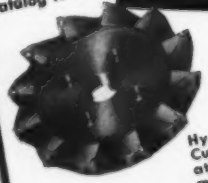
2426 University Avenue Saint Paul, 4, Minnesota



The Low Priced Vernon Precision Back-Geared 12" Shaper

NEW! CAL-CUTTERS—New, carbide-tipped, many types for all milling requirements! Write for catalog H-1.





Hyper Mill Cal-Cutter with negative rake for machining steel, illustrated.

Here's wise production strategy for improving tool room precision and production line output: Get an economical Vernon 12" Shaper with all the engineering advantages of expensive shapers. Accuracy, long life and important operating conveniences tailor this husky, LOW COST tool for *all* jobs requiring 12" stroke or less.

FEATURES: Back-geared for slow, powerful strokes • Helical Bull Gear and Pinion (adjustable) for smoothness • Anti-friction bearings throughout add years to life • Variable speed control provides flexibility • Tapered gibs gain rigidity • Automatic cross feeds provide for smooth, effortless cuts • Many other worthwhile features demand your inspection! Folder sent free—write for your copy!

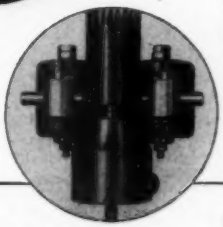
MACHINERY MANUFACTURING COMPANY
1915 EAST 51 ST. VERNON LOS ANGELES CALIFORNIA
Vernon Line of **HORIZONTAL MILLS, VERTICAL MILLS and JIG BORERS, SHAPERS and GRINDERS**



YOU CAN'T WIN THE WAR ON REJECTS

Every tapped and threaded part that doesn't meet Army or Navy specifications — every reject — means just one more delay in war-winning production. Rejects won't win this war, nor the "war" for commercial supremacy to follow. Threads will always need to be precision cut, whether for today's armaments or tomorrow's pleasure and commercial goods.

Without boasting, without exaggeration, we can truthfully say that no tool will give you the accuracy of threads as speedily and as easily as the Bakewell Tapping Machine. Hundreds of internationally known concerns in the U.S., Canada and Great Britain will verify this statement.



PATENTED FEED CONTROL

The tapping accuracy of the Bakewell Tapping Machine is made possible by the well-known Bakewell leading on mechanism. This consists of a hardened and precision ground Bakewell lead screw operated in conjunction with electrically actuated brass guide fingers which take the place of the old style nut. These guide fingers are hobbed with the same threads as those of the tap and lead screw. The solenoid action of the fingers mates them with the threads of the screw against a spring tension insuring accurate lead of tap in and out of hole. All backlash is eliminated. Class 3, 4 and even 5 gage fits are cut in any material, soft or hard, with one pass. Taps are saved from breakage. Rejects are eliminated. A tremendous saving of invaluable time, hard-to-get labor, critical materials is gained.

If your specifications call for Army or Navy threads, check into the Bakewell Tapping Machine today.

BAKEWELL
Manufacturing Co.
2023 SANTA FE AVE. • LOS ANGELES, CALIF.
PRECISION TAPPING MACHINES

5 DIFFERENT MODELS
Capacities from 0-80 to 4

Save TIME AIR MONEY!

HANSEN
AIR HOSE COUPLINGS *and* HOSE CLAMPS



Hansen air hose couplings and hose clamps are first choice in aviation plants, tank arsenals, large and small industrial plants throughout the country. Hansen couplings work easier, faster and are absolutely leakproof. They save time, air and money. Slight push, they're connected, air is automatically turned on, easy pull on sleeve, it is disconnected, plug is ejected, air is automatically turned off.

Hansen hose clamps are easy to install requiring no special tools, have two grips instead of one, inside and outside of hose. Economical, can be used many times over.

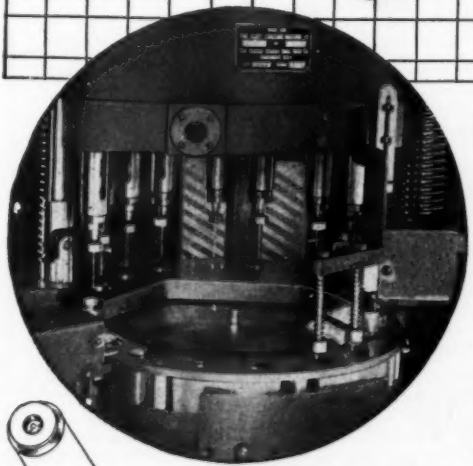
Send in for Free Catalog

Hansen mfg co.

★ *INDUSTRIAL AIR LINE EQUIPMENT*

1786 EAST 27th ST. • CLEVELAND, OHIO







PRODUCTION: 2000 *parts per hour, drilling two parts in each station, using No. 50 Drills.*
MATERIAL: *Brass.*

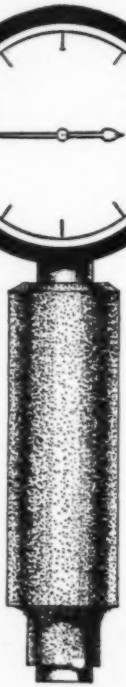
PRODUCTION CHARTS GO UP WITH *Avey* DRILLING EQUIPMENT

Your installation of our Avey Automatic equipment assures you—increased speed in production. This Standard No. 1 Cam Feed Unit Machine, with Drill Head and Automatic Index fixture, is adaptable to many operations including Drilling, Reaming, Counter Boring and Tapping. Send us prints of your requirements.

THE AVEY DRILLING MACHINE CO.
Cincinnati, Ohio, U. S. A.

Avey DRILLING MACHINES
CINCINNATI · OHIO

TRITON



The fundamental basis of all war production is precision and speed.

Substitute your flush pin gauges, snap height gauges, etc. for special dial indicator gauges. They are:

MANY TIMES FASTER IN OPERATION.

NEVER WEAR OUT.

MAKE NO MISTAKES IN READING.

We will design special dial indicator gauges to meet your requirements.

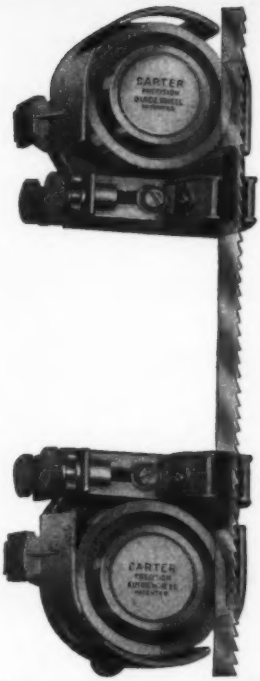
Write and tell us your problem—we might have the solution.

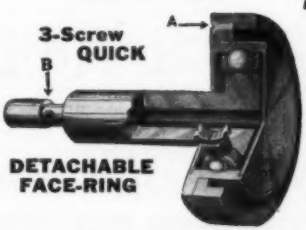
SPECIAL TOOLS
RING GAUGES
PLUG GAUGES
SNAP GAUGES
AND SPECIAL GAUGES

PROMPT DELIVERIES

TRITON PRECISION CORP.
GAGE AND TOOL MANUFACTURERS

1302 INWOOD AVE. N.Y.C.





3 Screws (A) permit quick replacement of face-ring when completely worn out. Oil-hole (B) lubricates shaft and ball-bearings at high speed.

Another New Carter
AID For VICTORY
with 100%
QUICK-RENEWABLE WEARING SURFACES

The CARTER
MICRO GUIDE PRECISION GUIDE WHEEL FOR BAND SAWS

Precision throughout describes the new CARTER MICRO GUIDE. Band saws equipped with them will produce better work and faster production. This is ***important*** in war work for Victory. But in addition to precision, the CARTER MICRO GUIDE is economical in saving vital critical materials and wearable replacement parts—for Victory.

SINGLE SET OF JAW BLOCKS

The CARTER MICRO GUIDE has only one set of jaw blocks—only one set is needed on modern saws. This reduces friction on saw blades by 50%. Each jaw block has ***independent micrometer adjustment.*** Adjusting screws keep operators' hands away from blade and wheel is completely guarded. This makes CARTER MICRO GUIDE the ***safest*** guide. Safety prevents injuries and delays—***saves manpower.***

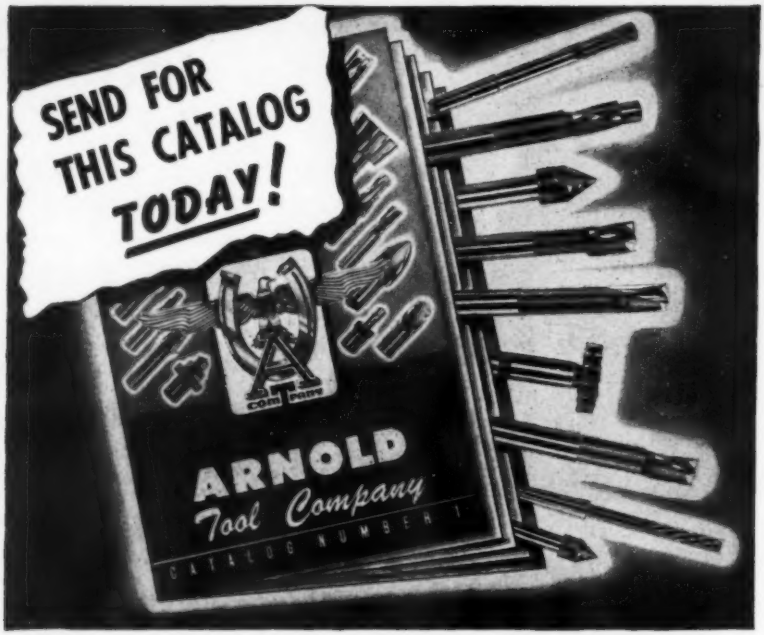
RENEWABLE GUIDE WHEEL RIM

Replaceable rim on CARTER PRECISION BALL BEARING GUIDE WHEEL is exclusive Carter feature. Replacement rim at nominal cost thus ***saving*** ball bearings which will last indefinitely.

EQUIP ALL YOUR SAWS WITH CARTER MICRO GUIDE.

CARTER PRODUCTS CO., INC., 204 Division Ave., N, Grand Rapids, Mich., U.S.A.

● **Also makers of Carter Rigid Band Saw Wheels with Demountable Tires for all 36' and 30' saws; and the Carter Guide Line Light, which throws a black shadow to speed straight line sawings. Write for facts!**



Here's a new quality line of
STANDARD AND SPECIAL TOOLS

For an additional, dependable source of quality cutting tools write for this new Arnold Tool Company catalog today. It's just off the press and contains the complete Arnold line of standard tools plus information concerning Arnold's ability to design special tools to your specifications. Over thirty years of precision toolmaking experience assures you of a quality product and deliveries are surprisingly fast. Write at once for this 40 page catalog. No obligation.

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Tool Company
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For Tapping brass, bronze, aluminum, plastics, cast iron or steel — the wide range of Winter Brothers precision-built taps will insure top production results — rapidly and accurately.

The Winter Tap Data booklet offers some practical suggestions in selecting the proper taps to use in these materials — and THE RIGHT TAP IS IMPORTANT in producing smooth-finish threads. Send for your copy today.

Always specify the material in which taps are to be used, so we can help you do your thread cutting quicker and better.

A division of

THE NATIONAL TWIST DRILL & TOOL CO.

ROCHESTER, MICHIGAN

Winter Brothers

COMPANY Wrentham, Massachusetts, U.S.A.



NO ABSENTEEISM WITH LIMA'S

LIMA GEARSHIFT DRIVES

for machine tools and other production equipment reduces "absenteeism" of machines and operators to a minimum.

Lima's simplified design, sturdy construction assures fast, smooth, accurate operations hour after hour, day after day, with less maintenance attention and with less operator fatigue.

Lima's are safe... it is not necessary for the operator to touch the belt at any time in changing or making new machine set-ups.

The Lima line also includes Pedestal Grinders, Magnetic Polishing Lathes and Electric Motors.

Wire or write for address of Lima Engineering Service nearest you.

Large enough to successfully serve you, yet small enough to give personal attention to your needs.



THE LIMA ELECTRIC MOTOR CO.

262 Findlay Road

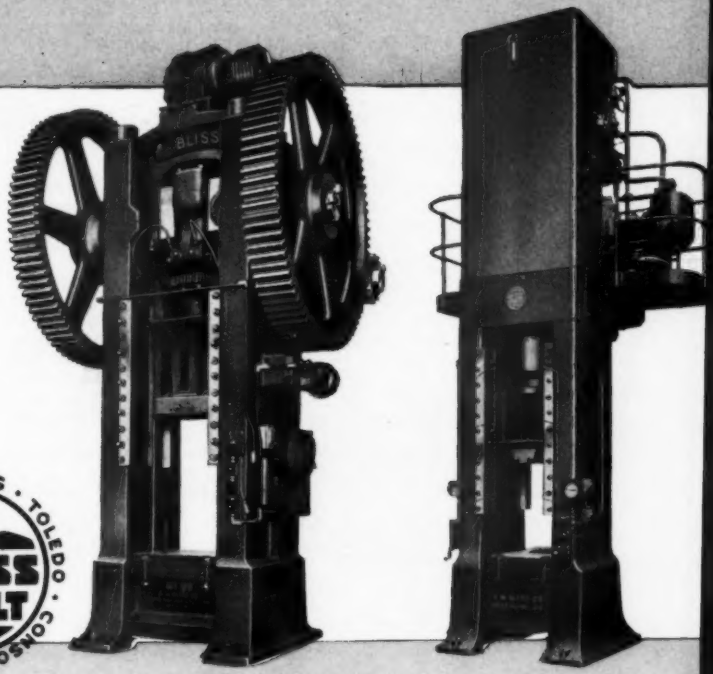
LIMA, OHIO

REPRESENTATION IN MOST PRINCIPAL CITIES

LIMA GEARSHIFT DRIVES - LIMA ELECTRIC MOTORS
LIMA MAGNETIC POLISHING LATHES - LIMA PEDESTAL GRINDERS



MECHANICAL OR HYDRAULIC PRESS?



BLISS BUILT · BLISS · TOLEDO · CONSOLIDATED · MARQUETTE ·

IN THE PRESS INDUSTRY there are particular applications of presses for which only the mechanical press is suitable. At the same time, other uses find the hydraulic system essential. There is also a wide field wherein either press may be used and where the advantages of each must be weighed carefully before a final choice is made. This applies alike to both single-action and double-action presses.

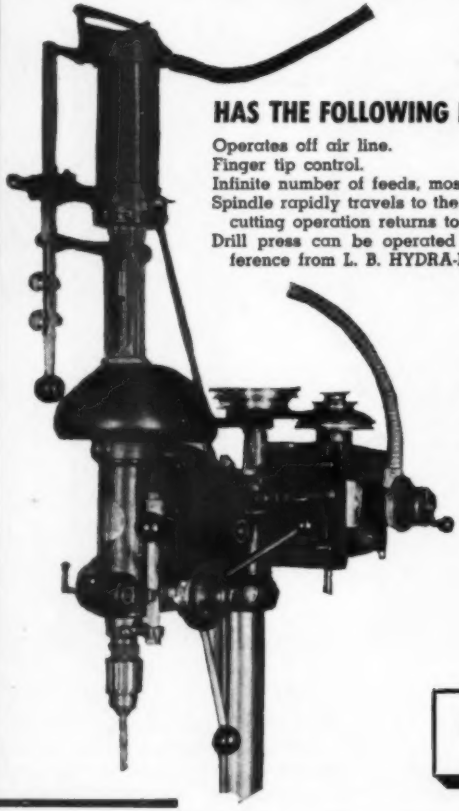
In this middle field, the variable factors to be considered before selecting either type can best be weighed by an organization which builds both types, and will therefore be completely impartial in its recommendation. This unprejudiced judgment is demonstrated by the installation of both Bliss Mechanical and Bliss Hydraulic Presses on all six continents.

Call Bliss for unbiased press recommendations.

E. W. BLISS COMPANY

53RD STREET AND 2ND AVENUE • BROOKLYN, N. Y.

The New L. B. HYDRA-DRILL



HAS THE FOLLOWING DISTINCTIVE FEATURES

Operates off air line.

Finger tip control.

Infinite number of feeds, most desirable when reaming.

Spindle rapidly travels to the work and upon completion of cutting operation returns to uppermost position.

Drill press can be operated conventionally without interference from L. B. HYDRA-DRILL.

Depth of cut accurately controlled, an important feature for accuracy when counter-boring, spot facing, or blind drilling.

Spindle can be instantly returned to uppermost position by fingertip control. (A safety feature.)

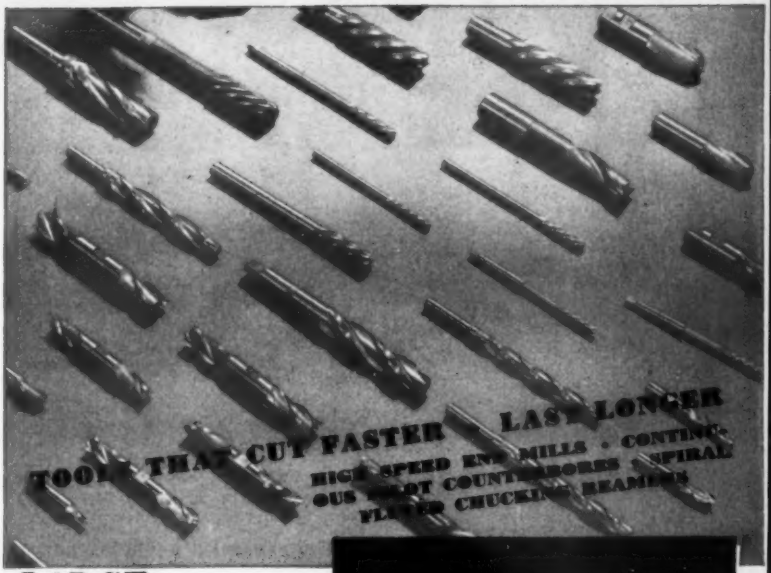
Treadle control an optional extra.

Limit Switch synchronized with HYDRA-DRILL for automatic starting and stopping of motor, an extra.

WRITE FOR FULL DETAILS.

L. B. MANUFACTURING CO.

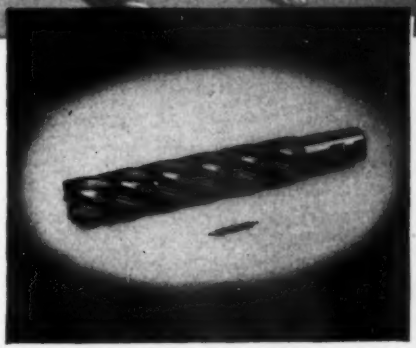
3916 WEST SLAUSON BLVD. LOS ANGELES, CALIFORNIA



LARGE or SMALL

PUTNAM END MILLS

Whether of 1/16" diameter or sizes up to the largest end mills made, all Putnam Hi-Speed End Mills permit maximum speed and feed. In addition, manufacturing and heat treating methods assure unusually long, trouble-free service. It is by actual use on your toughest milling jobs that you can prove to your own satisfaction that the end mills which do "cut faster and last longer" are produced by Putnam.



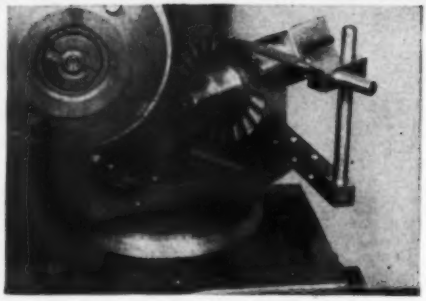
MANY PUTNAM END MILLS ARE NOW AVAILABLE FROM STOCK. CALL YOUR PUTNAM REPRESENTATIVE FOR DETAILS.

AWARDED AUG. 15, 1942

PUTNAM TOOL COMPANY

2983 Charlevoix Ave. • Detroit 7, Michigan

NEW Universal Radius & Grinding Fixture!



Patent applied for

Simplifies Grinding Operations

An ingenious fixture that makes it possible to grind RADII or angles on cutters or fluted tools without form-dressing grinding wheels.

Greatly simplifies the grinding or re-sharpening of cutters and fluted tools as well as grinding end chamfers.

Lends itself to many other applications.

Adapted to any surface grinder.

WRITE for CIRCULAR



Grinding end mill

UNITED INDUSTRIES

8344 Second Blvd. **Detroit, Mich.**



Set-up for radius on end mill



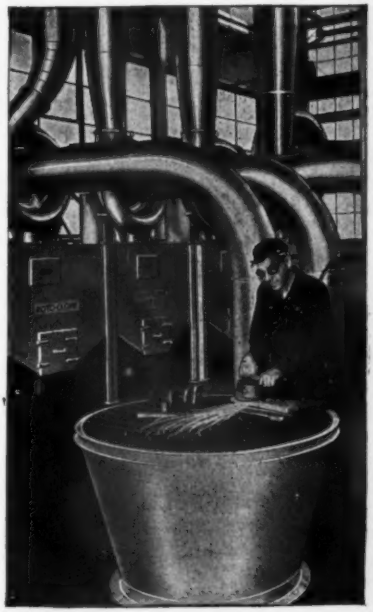
Sharpening end of end mill



Sharpening clearance on milling cutter.

COLLECTING PORTABLE GRINDER DUST WITH DOWN DRAFT EXHAUST BENCHES SERVED BY ROTO-CLONES!

Roto-Clone down draft exhaust arrangements such as are in use in the Cincinnati Bickford Tool Company's finishing department are in wide use for collecting fine portable grinder dusts. Generated dust is pulled downward from the grinding tools through the grilled bench tops and conveyed through ducts in underfloor pipe trenches to the Roto-Clone precipitators. These units may be conveniently located in unused space any where in the work room. Benches are available in a wide range of sizes and designs.



Complete information on the application of Roto-Clone to all types of industrial dust control is available without obligation. Send for free Bulletins.

AMERICAN AIR FILTER CO., INC.

312 CENTRAL AVENUE LOUISVILLE, KENTUCKY

IN CANADA: DARLING BROS., LTD., MONTREAL, P. Q.

AMERICAN AAF AIR FILTERS

HARTFORD



MILLING VISE

This time tested "Four-Point" Milling Vise has performed most successfully for a number of years in large manufacturing plants producing interchangeable parts. It is designed and constructed to take the present day feeds and speeds of modern milling machines . . . it is particularly adaptable to small arms milling. Production milling work today cannot afford the time and cost of a slow operating vise. Speed is essential, inquire now.



SUPER SPACER

The Super Spacer, with its attachments and fixtures, has proven to be a tool of exceptional value for the rigid control of accurate machining operations. It is adaptable for Milling, Drilling, Grinding, Jig Boring, and Slotting, at feeds and speeds limited only by the capacity of the holding means and the power of the machine.

Send for circular giving details.

HARTFORD SPECIAL MACHINERY COMPANY

HARTFORD, CONNECTICUT

Up-to-the-Minute EFFICIENCY



BUILT INTO THE *Heart* OF YOUR

SCREW MACHINES

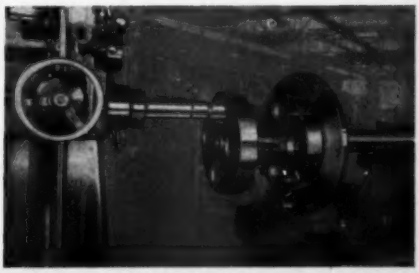
Conversion of screw machine spindle carriers to the most modern and efficient design has for many years been a specialized service offered by Modern Collet. This work is handled either as an individual job or as part of the complete rebuilding and modernizing of machines.

When carriers are received at Modern Collet, taper roller bearings, providing four times the life of the old bronze bearings, are installed. Friction is eliminated, as the spindles with roller bearings revolve more freely and yet are much more rigid. End play in the taper roller bearings can be adjusted in only a few seconds. The elimination of up and down play and end play has resulted in increased tool life—in many cases as high as 50% to 75%.

Extremely Accurate Boring of SPINDLE CARRIERS

Shown above is a spindle carrier for a Gridley Automatic being bored for taper roller bearings. These carriers are all bored to a limit of plus or minus .0005". This is one of the most exacting jobs in the construction of any screw machine. The accuracy of the work done on carriers by Modern Collet is one of the principal reasons why our rebuilt machines can be guaranteed to block test within .002" total indicator reading.

Fast service can now be promised on spindle carrier work. Full information will be furnished you immediately upon request.



MODERN COLLET and MACHINE CO.

403 Salliotte Street - - - Ecorse, Michigan

ALLISON COLLET CHUCK



FULL SPINDLE CAPACITY

PRECISION BUILT — UNSURPASSED FOR PRODUCTION

ROUND HEXAGON **COLLETS** SQUARE SERRATED

Immediate Delivery

SEE YOUR DISTRIBUTOR OR WRITE

Allison

TOOL & ENGINEERING COMPANY

4031 WHITTIER BLVD LOS ANGELES, CAL.



Only THE LEMPCO-EVANS HAS ALL THESE FEATURES:

- Finishes holes to tolerances of .0001"
- Eliminates Honing
- Extension Pilots for Alignment Jobs
- Locked-in Patented Blades Prevent Chatter
- Expansion from .050" to .080"

* (Sizes under 11/16" slightly less.)

DUAL SPIRAL BLADES REAM PRECISION HOLES

Whether you work with bronze, aluminum, iron, steel, nickel alloys, or all of them, Lempco-Evans Hi-Speed Steel Reamers are equally superior. Patented Dual-Spiral blades finish holes to tolerances of .0001". Straight line expansion from .050" to .080" maintains size, keen cutting edge, and permits many resharpenings.* Removable spiral blades, shearing opposite ways simultaneously, ream over slots or keyways.

For Special Jobs, Send Blue Prints.

LEMPCO

5729 DUNHAM ROAD
BEDFORD, OHIO

Three More Simple Check-Ups

THAT HELP TO KEEP CP UNIVERSALS IN CONTINUOUS SERVICE

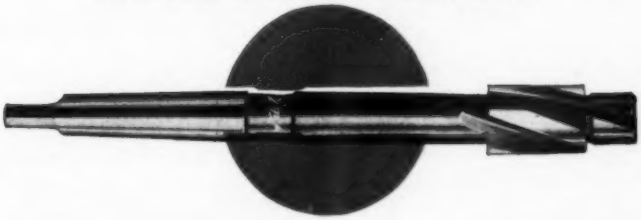


Keeping a drill, grinder, nut runner, screw driver or other CP Universal Electric Tool in continuous service is largely a matter of simple, preventive maintenance — because CP Universals are distinctly production tools, designed and built for steady, hard service. The three simple precautions illustrated on this page (and the periodic lubrication featured in a previous advertisement) will help you get maximum service from all models of CP Universal Electric Tools.



NOW Welch OFFERS

STANDARD
HIGH SPEED FOUR FLUTE
COUNTERBORES
IMMEDIATE DELIVERY



Three pilot sizes carried in stock. Unless specified the No. 1 will be shipped.

STRAIGHT SHANK

Order by This Number	Screw Size	Pilot Diameter 1	2	3	Cutter Diameter	Shank Diameter	Length Overall	Net Price Each
1-4-SS	1/4	1/4	17/64	9/32	11/32	1/4	3 1/2	$2.55
1-4-LS	1/4	1/4	17/64	9/32	11/32	1/4	5 1/2	3.00
5-16-SS	5/16	5/16	21/64	11/32	13/32	1/4	3 3/4	2.70
5-16-LS	5/16	5/16	21/64	11/32	13/32	1/4	6	3.15
3-8-SS	3/8	3/8	25/64	13/32	15/32	1/4	4	2.90
3-8-LS	3/8	3/8	25/64	13/32	15/32	1/4	6 1/2	3.25
7-16-SS	7/16	7/16	29/64	15/32	17/32	1/4	4 1/2	3.15
7-16-LS	7/16	7/16	29/64	15/32	17/32	1/4	6 1/2	3.65
1-2-SS	1/2	1/2	33/64	17/32	19/32	1/4	5	3.45
1-2-LS	1/2	1/2	33/64	17/32	19/32	1/4	7	4.10

TAPER SHANK

Order by This Number	Screw Size	Pilot Diameter 1	2	3	Cutter Diameter	Shank Diameter	Length Overall	Net Price Each
1- 4-1T	1/4	1/4	17/64	9/32	11/32	#1 Morse	5 1/2	$3.10
5-16-1T	5/16	5/16	21/64	11/32	13/32	#1 Morse	6	3.25
3- 8-1T	3/8	3/8	25/64	13/32	15/32	#1 Morse	6 1/2	3.35
7-16-1T	7/16	7/16	29/64	15/32	17/32	#1 Morse	6 1/2	3.75
1- 2-2T	1/2	1/2	33/64	17/32	19/32	#2 Morse	7	4.25
9-16-2T	9/16	9/16	37/64	19/32	21/32	#2 Morse	7 1/2	4.85
5- 8-2T	5/8	5/8	41/64	21/32	23/32	#2 Morse	7 1/2	5.60
3- 4-2T	3/4	3/4	49/64	25/32	1 1/32	#2 Morse	7 1/2	6.90
7- 8-3T	7/8	7/8	57/64	29/32	1 1/32	#3 Morse	7 1/2	8.50
1-3T	1	1	1 1/64	1 1/32	1 11/32	#3 Morse	9 1/2	10.35

Welch INDUSTRIES, INC.,

20000 W. 8 MILE ROAD, DETROIT, MICHIGAN

MANUFACTURERS OF HIGH SPEED MILLING CUTTERS — FORM TOOLS — SPECIAL TOOLS

NEW



COUNTERBORE
and Spot Facer
WITH MOVABLE INSERTED CUTTERS

MADE IN 41 STANDARD SIZES — FROM 1″ TO 3½″ DIA.

only NASH-ZEMPEL has these 12 features

1. Cutter removed easily for sharpening.
2. Cutter always aligned accurately with body of bar.
3. Maximum cutter life.
4. Milled web locates fingers of cutters while cone nut centers rear of cutter.
5. Movement of cutter equals expendable portion.
6. Cutting edge of tool always in same place.
7. Chip clearance in bar — not in cutter.
8. Easy method of locking cutter securely.
9. Economical to operate — only cutter to replace when used up.
10. New cutter — means new spot facer or counterbore.
11. Pilot drilled and tapped to hold different size bushings.
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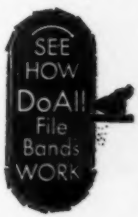
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Photo Courtesy Bell Aircraft



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Available with or without power feed. Capacity up to 1" in cast iron, ¾" in steel. Standard spindle speeds 260 to 5200 r.p.m. Made also in single spindle, bench and floor models.

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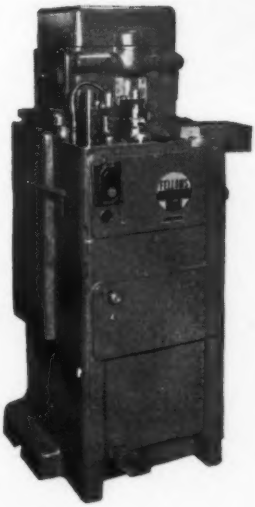
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Fine-Pitch Gear Shaper

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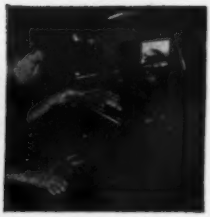
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Showing operation with Universal Milling attachment on tool room job producing a production fixture.





Showing operation with four cutters machining alloy steel for high precision aircraft parts

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Operation showing set-up for internal grinding.





Operation showing set-up for sharpening straight gash hobs.

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Van Keuren

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A *Standard* FOR ACCURACY IN LEADING WAR PRODUCTION PLANTS

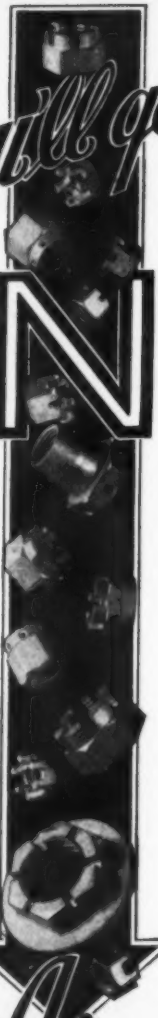
The wire system of thread and gear measurement is easy to use and gives exceptionally accurate results. Our Manual of precision measuring tools gives complete tables and simplified formulas for measuring all standard threads, splines and spur gears. Send for this valuable handbook.



Leading arsenals and war production plants know the importance of accuracy in thread and gear measuring. That is why so many of these plants are using Van Keuren Measuring Wires as standard equipment for measuring thread gages, taps, worms, splines and spur gears. Made in any size from 1.5708" down to .002" in diameter, they are guaranteed to be within .00002" for roundness and straightness and within plus or minus .000025" for size. Special sizes can be made to your specifications as to size and tolerances. Easy to use, VK Wires bring ultimate accuracy to your operations. Write for full details.

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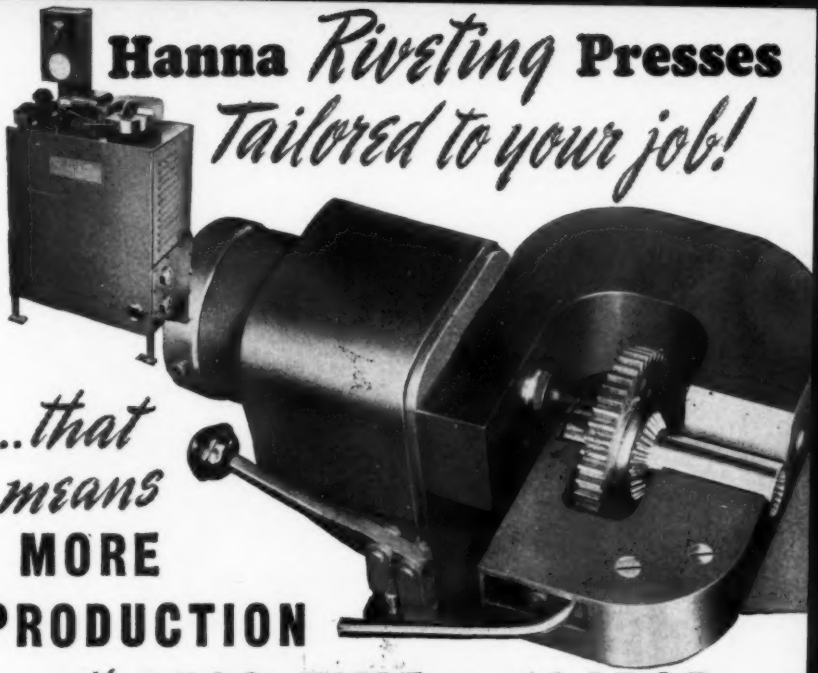
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...that means MORE PRODUCTION *with* LESS TIME *and* LABOR

HANNA Riveting Presses will enable you to attain maximum riveting and upsetting production in less time, with less labor, at less cost . . . *and here's why:* Hanna designs and builds riveting presses "tailor-made" to meet specific riveting or upsetting production problems. Completely automatic in operation, Hanna Presses drive from one to six or more rivets simultaneously — with a single rapid and smooth stroke.

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Featured In This Issue

STEEL SHELL CASE TECHNIQUE by Lloyd Stouffer describes Buick's important contribution to the war effort in the story beginning on page 123

EXTENDING TOOL LIFE is by W. L. Kennicott, Tool Engineer, Kennametal, Inc. See page 151

PRODUCING SMALL MACHINE TOOLS is a continuation of the series of articles by Dr. H. A. Frommelt. See page 165

"TOOLS ARE WAR WEAPONS" offers constructive suggestions on tool conservation. See page 181

FOREMANSHIP FORUM—Part 12—discusses "Intelligent Selfishness." See page 201

EARLY DIAMOND TOOLS is the second article of a series by Paul Grodzinski. See page 225

PAY AS YOU GO INCOME TAXES by Arthur Roberts, outlines provisions of this new legislation. See page 235

LET'S TALK SHOP is the regular collection of hints and kinks, commencing on page 243

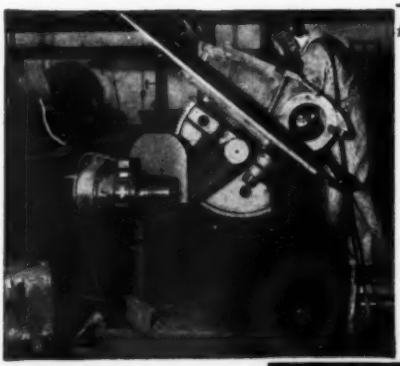
BRAZING NON-FERROUS JOINTS reviews four methods regularly used by Westinghouse. See page 272

WHAT'S NEW IN METALWORKING—presents innovations in equipment and methods. See page 278

MECHANICS THRU THE AGES — Blue Book's feature picture page 406

C-F POSITIONERS

Cut Welding Time
Reduce Welding Cost
Improve Welding Quality



★ All sides, top and bottom, are welded downhand with one set-up. No waiting for the crane, no "handling" crew needed, for the welder himself rotates (360°) and tilts weldment (to 135° beyond horizontal) with a push button control. This "all-down", hand welding method permits use of larger rods, hence requires fewer passes and gives stronger, smoother, more uniformly flawless seams and joints.

C-F Positioners, pedestal mounted and adjustable for height, come in 6 capacities — from 1200 lbs. to 30,000 lbs. Manual, motorized or motorized variable speed operation.



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★ BUY U.S. WAR BONDS ★

SAVING TIME is of vital importance, for every second saved hastens victory and brings us that much closer to peace.

Time is saved and precious machine hours are gained on many operations through the use of South Bend Lathes. Their wide range of spindle speeds permits machining work with maximum cutting tool efficiency. Their versatility keeps setup time to a minimum—adding hours to machine output on short runs or when product specifications are frequently changed. Conveniently placed, smoothly operating controls contribute to an ease of operation that reduces fatigue and increases manpower efficiency.



Write for your copy of Catalog 100C which describes all the South Bend Lathes.

Most important of all time-saving advantages is South Bend's dependable precision which assures maximum production even when extremely close tolerances must be maintained.



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As The Editor Sees It



RECENT news from the fighting fronts has been encouraging, as the big push is getting under way.

But there is room for improvement here on the war production front.

Blame it on the man-power shortage, redesign and change-overs, absenteeism, strikes, floods or just a complacent feeling that victory is already in the bag — the facts show we are not delivering the goods.

According to Donald Nelson, Chairman of WPB, production of war material, altho at a high level, fell short last month by half-a-billion dollars of meeting a six-and-a-half-billion-dollar goal.

When production falls below the quota, the army loses both equipment and time. If sufficient time is lost, it can upset our military timetable.

We face a staggering job in meeting the constantly rising production schedule for next year. We must sustain an increasing production tempo if we hope to hasten the end of the war.

Bigger battles are coming. They will involve losses of men and material. Increased production now and in the days to come can save thousands of lives.

Some new plants are swinging into war production. Machine tool builders who can, are preparing to make war material with all available capacity.

What is really needed is an increase in man-power efficiency, with each worker conscientiously producing more — for Victory.

Wesley G. Paulson



CONCERNING

Wartime Vacations

The terrific pace of war production continues—and with metals still on the critical list—men who buy are under greatest pressure. But brief periods of mental relaxation are still essential to health and efficiency. So, in the interest of your country, your company, your family and yourself—you should take some time off this summer.

True, travel is restricted. The boys in the Service have priority on transportation and God bless them. But a happy vacation really doesn't depend on distance—so plan ahead—leave your worries behind and soak up some good old sunshine.

And—as far as steel is concerned—tell your men to depend on Ryerson. Our stocks are still the most complete. And where war requirements have created some shortages, we can usually offer substitutes that will do the job as well.

So go ahead—enjoy yourself. *Joseph T. Ryerson & Son, Inc., Chicago, Milwaukee, Cincinnati, St. Louis, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.*

RYERSON

Steel Shell Case Technique

By LLOYD STOUFFER

THE full story of steel shell case production, as practiced by one of its leading exponents, is now disclosed for the first time with the approval of the War Department.

As revealed earlier by Ordnance officials, Buick Motor Division of General Motors is one of three producers using a hot process for formation of the cups from which artillery shell cases are drawn. The other two hot-cupping techniques are similar; the remainder of the 50-odd manufacturers of steel shell cases use cold work thruout. From the cup stage onward, all processes are virtually identical.

Buick's program is particularly interesting in that it makes use of former automotive hood and fender presses for the vital cupping and drawing operations. Thruout the Buick plant now devoted to shell cases, the big presses and machines have been ingeniously converted from automobile manufacture to mass production of steel shell cases—once considered a metallurgical impossibility.

Buick's production, as described and pictured here, is in the important 75-mm size, but the Buick process has been made available to the Government for use by other manufacturers without license.

The metallurgical and production problems faced at the outset of this development were staggering. There is virtually no permissible tolerance in the physical properties of the steel shell case. If it is hard or too brittle, it will crack when fired, and if it is too soft, the explosion pressure will cause it to stick in the gun barrel.

The purpose of a cartridge case is to act as a container for the propellant charge, to prevent the escape of gases resulting from the explosion and to permit rapid firing. The wall of the case must be elastic enough to expand under the explosive pressure and make a tight seal against the breech wall of the gun. Unless it is properly supported by the breech wall, the pressure developed is sufficient to burst any case.

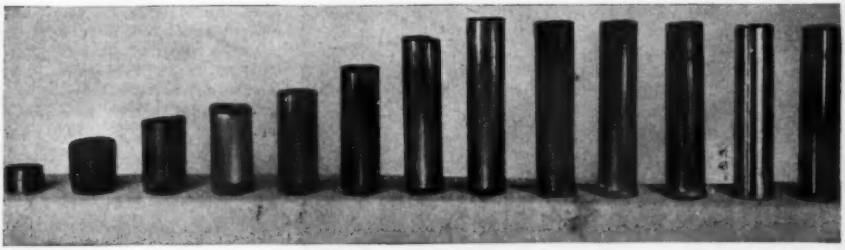


Fig. 1—The Buick 75mm steel shell case at 13 progressive stages of manufacture, from blank (left) to finished case.



Fig. 2—Heating for the hot cupping operation is done in a specially built induction heater, the piece being brought to temperature in 1-1/2 minutes. The machine has two fixtures which may be operated simultaneously, permitting a production rate of 80 pieces per hour. This is another of many new industrial applications of electronic heating — in which the speed, flexibility and precise results are decided advantages.

A certain amount of clearance is necessary between the cartridge case and the breech wall to permit ease of loading and ejection under field conditions. The cartridge case must expand, first to take up this clearance, and continue to expand as the breech diameter increases due to the explosion pressure. The case must have enough elastic recovery to allow easy ejection after firing, and in contrast with the high physical properties required in the body of the cartridge case, the mouth must be annealed or softened to insure complete obturation.



Fig. 4—After cooling somewhat, the cup is returned to a crank-type press for a hot redraw, which extends the draw about 2" further, or to 6" in all. This press is the same as that in Fig. 3, except for altered tooling.



Fig. 3—Hot extrusion of the blank into a cup shape is a vital first step in production of the steel cases, and the one in which Buick differs from all other producers. An ordinary automotive crank type forging press is used. The upper member is a hot die nitrided steel punch, rounded at the end. The lower die has a cavity the size of the formed cup. The punch extrudes the blank from 1-3/4" to about 4".

Since the modulus of brass is 14,000,000 as against 30,000,000 for steel, it is necessary to have a much higher yield strength on a steel case than brass. In the 75-mm size, this yield strength must be upward of 100,000 pounds per square inch. Other considerations are corrosion and sparking, which must be overcome by suitable protective coatings. The steel cases must be interchangeable with brass and function equally well in service.

These, in short, were the requirements faced. They were met by Buick metallurgists and die specialists, long experienced in the deep drawing of steel for automobile production, who devised a



Fig. 5—A general view of the type of Toledo No. 58 crank presses used by Buick for the hot cupping and hot redraw operations.
Illustrations on the following pages show many of the interesting manufacturing processes.

successful manufacturing method, utilizing machines and equipment on hand and —most surprisingly—a common carbon steel which was readily available in contrast to alloyed steels higher on the critical list. Thruout their research, Buick technicians were aided by the Army and Navy specialists and the Cartridge Case Industry Committee.

Tracing the history of the development, R. B. Schenck, Chief Engineer of Buick reveals that a request for ideas on the subject first came from the Navy Department in July, 1941. Only the barest details were available. Nevertheless, the Buick management advanced funds without a contract, and started work.

The original work was done on an extruding die about one-third the size required for a five-inch Naval case, and preliminary efforts were mainly directed at meeting dimensional specifications rather than physical properties. When the first extruding die was found to work satisfactorily, experimental redraw and heading dies were made and the first case produced.

Later the three-inch case was adopted because experimental work could be carried on faster with this than with the five-inch size. As the experiments developed, and ordnance tests were made, the Army requested Buick to concentrate



Fig. 6—The head of the extruded cup is cold-sized in this former automotive sheet metal stamping press, a Toledo No. 96-B, which is equipped with special dies. This added operation helps to control wall thickness, and draws the case out only slightly.

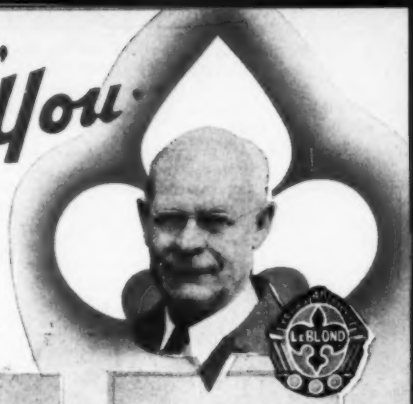


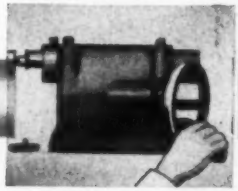
Fig. 7—Annealing follows, after cold sizing, in this modern furnace. Acid pickling comes next; then washing to remove scale and coin heading in another crank press.

I'm Tellin' You

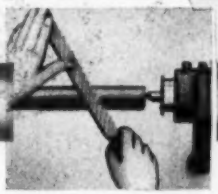
No. 12 in a series on "Keeping 'em Turning" by Charles Carr, 37 years at LeBlond

"We old-timers have been passing along the tips on 'Keeping 'em Turning' and we've given you about every important point in the book. But no matter how good a job of turning you've done, it's pretty tough to get a finish smooth enough to be used directly in service. You won't always have a grinding machine available and that's where filing and polishing come in. This is the way an old-timer does it . . ."

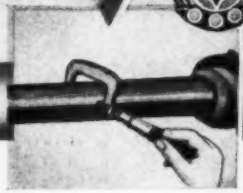




With work set up on headstock center, run tail center up tight, then slack off slightly and start lathe to run at twice finish turning speed, adjusting center to allow dog to click in face plate but not to allow rattle or end shake.



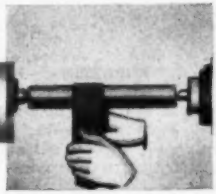
Use a 12-inch mill file with slow, even strokes, lapping from side to side. Use a long, slow forward stroke and press firmly and evenly on the revolving piece being filed. Relieve pressure on return stroke.



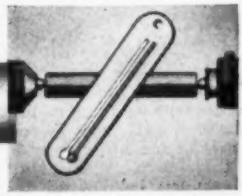
Stop lathe and try diameter with micrometer frequently until whole surface is filed as straight and smooth as possible. Leave from five to eight ten-thousandths (.0005 to .0008) of an inch for polishing the work.



For polishing work that is well-balanced, set change levers to give the highest possible speed. On unbalanced work, run the lathe at highest speed possible without vibration. A speed lathe is best for straight shafts one inch or less in diameter.



Use strip of emery or carborundum paper of fine grade and press against work, moving abrasive cloth from side to side to cross lines and bring work to rough polish without cutting rings. Use very fine abrasive cloth and oil on work for final polish.



Watch out for heat! Remember, polishing and filing heat the work. When measuring with a micrometer, either cool the work by immersing in water or else make an allowance of one or two ten-thousandths of an inch for cooling of work.



THE R. K. LeBLOND MACHINE TOOL CO.
Cincinnati, Ohio
Largest Manufacturer of a Complete Line of Lathes

on the 75-mm case, and the Navy decided to be guided by the Army developments. This, in November, 1941, marked the formal start of the Buick 75-mm steel shell case program.

As explained by Schenck, the required physical properties of a steel case can be obtained, either by cold work alone or by quenching and tempering before or after cold working. However, cold working alone was found to involve the least number of operations, fewer shop problems, less equipment, and was proved adequate.

treatment prior to cold forming. Among the compositions tried during the development were S.A.E. 1015, 1016 and 1020, along with A.I.S.I. C-1019 and a higher manganese type containing .20 carbon and 1.29 manganese. Experimental lots of C-1019 included coarse-grained, fine-grained, aluminum-killed and silicon-killed steel.

The composition which finally met all requirements and is now in production is an open-hearth, high-manganese, aluminum-killed, fine-grain carbon steel.

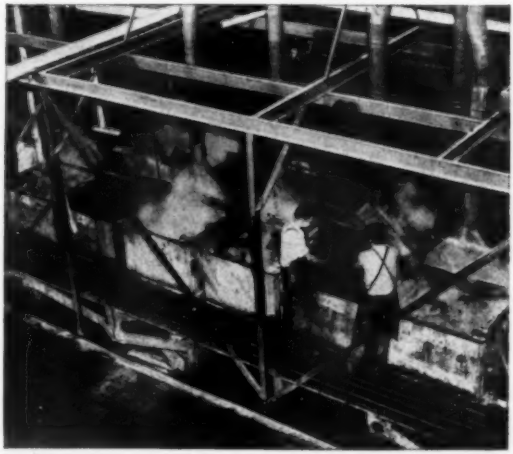


Fig. 8—Bonderite treatments serve both to clean the surface of the case thoroly and to etch it slightly, permitting better retention of the drawing compound in the cold drawing operations which follow.

"Quenching after cold working", Schenck explains, "results in distortion of the case which must be controlled by intricate quenching dies or by additional sizing operations. Quenching followed by cold working eliminates the distortion problem and has been employed successfully on experimental lots. Where cold working alone, or quenching before cold working is employed, a final stress-relieving treatment should be used to further improve the physical properties."

In his selection of a material, Schenck finally decided upon a low-carbon steel which could be cold-worked and stress-relieved to the required physical properties without resorting to a spheroidizing

Schenck cautions that the physical quality of the raw material is of the utmost importance. Best mill practice with regard to discard, surface conditioning and macrostructure is essential. The shell case must have both strength and ductility.

Buick manufacture of the 75-mm case involves 31 steps, of which the most important, in order, are:—Hot extrusion of the cup and hot redraw, cold sizing, annealing, acid pickling, bonderizing, cold draw, trim end, three cold redraws, trim end, a fourth cold redraw, bonderizing, cold heading, flame annealing, taper, annealing, machine base, face to length, finish ream and counterbore, final draw,

THE GRAND RAPIDS NO. 1½

UNIVERSAL CUTTER AND TOOL GRINDER



REASONABLY PROMPT DELIVERY

The Grand Rapids No. 1½ Universal Grinder has been designed and built to meet the demand for a high grade machine of medium capacity selling at a moderate price. This machine can be operated from the front or rear. Transverse, vertical and longitudinal movement can be made from either position.

Both vertical and cross movements are provided by means of an "Acme" thread in a bronze nut of liberal size. Both are fitted with graduated dials reading in thousandths of an inch. Sturdy, rigid of design it insures a freedom from vibration and guarantees the ability to produce accurately ground tools.

A powerful 1 H. P. motor built into the base provides spindle speeds up to 3450 R. P. M. Universal type head stock with swivel base graduated in degrees so that an angular setting can be arranged.

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GALLMEYER & LIVINGSTON CO.

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Fig. 9—Here is the 750-ton Clearing double-acting press on which the most spectacular operation of the entire steel shell case process is performed. The press, formerly used in automotive production, is equipped with special four-stage dies, which successively draw the cup from its 6" length to a 15" shell case in approximately its finished form—a cold draw of 9", with no substantial change in diameter.

phosphoric acid pickle, resin coating, baking.

The appearance of the cases at various stages of manufacture is shown photographically in Fig. 1.

Buick deviates from standard practice somewhat at the start by using a 3⅛" diameter blank, rather than a three-inch. Experiments indicated that by starting with the larger blank it was possible to get a better filling of the dies in the hot cupping operations. Centerless grinding of the blank is used to obtain a more perfect surface, eliminating defects which would tend to carry thru subsequent operations.

Heating for the hot cupping operation is done in a specially built induction heater, the piece being brought to temperature in 1½ minutes. This operation is shown in Fig. 2. The machine has two fixtures which may be operated simultaneously, permitting a production rate of 80 pieces per hour. During the brief period of heating, a yellow gas flame is directed onto the steel, enveloping it and preventing scaling. The current kicks off when the piece has been brought to temperature, and it is then transferred to a gas-fired muffle furnace, where it is held for seven minutes to insure an even temperature thruout the steel.

This setup, according to Schenck, is only temporary. Two new induction heating units are on order which will eliminate the soaking furnace.

The extrusion is done in a standard forging press of the crank type common to automotive shops, such as shown in Fig. 3. The upper die member is a hot die steel punch, nitrided for improved wearing qualities and rounded at the end to form a smooth radius at the base of the cup. The lower die has a cavity the size of the formed cup, or virtually the same diameter as the heated blank. The punch extrudes the blank from 1¾" to



The right file speeds the job, cuts the cost

Nothing has ever so sharply emphasized the value of special tools for specific jobs as the mass production programs of our huge war industries.

They justify, conspicuously, this company's far-sighted pioneering in designing many of the special purpose files which today are speeding up thousands upon thousands of individual filing operations.

Besides supplying large quantities of the Nicholson or Black Diamond Special Purpose Files shown above, Nicholson has recently developed a special file for tank armor-plate fitting; and another for magnesium filing in incendiary bomb manufacture. . . . Nicholson file engineering never rests—and quality manufacture is never lowered. *Send us your filing problems.*

Send for "FILE FILOSOPHY"

This 48-page Nicholson book tells more about the above-illustrated and other files; about proper use and care of files, etc. *FREE.*

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(Also Canadian Plant, Port Hope, Ont.)

NICHOLSON FILES
FOR EVERY PURPOSE

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about four inches. A standard forging grease or graphite paste is used to lubricate the dies, and there is no trouble with sticking of the formed piece because a stripper on the punch removes the part on the upstroke of the punch.

Altho in the early stages of the work, only one hot cupping operation was used, it later was determined that better results could be obtained if a second hot operation was carried out after the piece had cooled somewhat. This is shown in Figures 4 and 5. The second hot press is the same as the first, except that the tooling is altered slightly to extend the draw two inches further, or to about six inches in all.

Finally, after the original setup was worked out, an extra operation was added to control the wall thickness. The cup is cold sized in a press (Fig. 6), drawing it out only slightly. This is done after the hot redrawn cup has cooled in air.

Annealing follows, (Fig. 7), then acid pickling and washing to remove scale; and then the head of the cup is coined in a crank press. This operation also sizes it accurately as well as giving this portion of the case some extra cold work, because in the subsequent cold-drawing operations the head does not receive as much work as the walls.

Bonderite treatments which follow (Fig. 8) serve both to clean the surface of the case thoroly and to etch it slightly, so that minute pockets will retain drawing compound in the cold operations. Furthermore, the thin surface layer of zinc phosphate deposited during this chemical treatment acts as a lubricant during cold drawing.

Possible hydrogen embrittlement resulting from the acid pickling and bonderite operations, which would tend to cause breakage during cold drawing, is



Fig. 10—A close-up of the four-stage die setup on the 750-ton Clearing. The four punch and die stations, placed at the four corners of the platen area, carry approximately 150 tons load each. Depth of draw varies slightly over the four dies, being controlled by length of the punch. The shell case progresses from left-hand to right-hand station on one side, and is then handed through to repeat on the other two stations. Each punch has an integral mechanical stripper which removes the part after drawing.

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MORE ACCURATE THREADING •

—That Will Help You Beat Your Schedule—Install a

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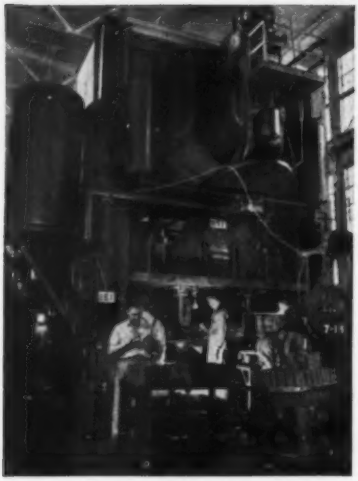


Fig. 11—Another view of the 750-ton Clearing press which accomplishes a 9" cold draw in four successive stations. A special drawing compound, with a base of machine oil, helps to prevent tearing or splitting of the work, and few pieces are rejected. Pieces shown on tables in foreground are the six-inch cups prior to drawing.

eliminated by annealing, which drives off absorbed hydrogen.

Then follows the most interesting and the most crucial step of the entire operation—the four cold drawings, all of which are carried out with a single 750-ton Clearing double-acting press (Figures 9, 10 and 11). The four punch and die stations are placed to form the four corners of a rectangle, well within the platen area, and are so arranged as to carry approximately an equal load of around 150 tons per station. Depth of the draw varies slightly over the four dies, being controlled by the length of the punch. The shell case progresses from the left-hand die to the right-hand die on one side of the press, and is then handed thru the die opening and placed on the die directly across from the second station, finally moving to the right-hand die on that side. Four operators handle the press, one at each die. Each punch has an integral mechanical stripper which removes the part after drawing.

This spectacular four-stage operation provides the supreme test of the drawing qualities of the steel. The six-inch cup is drawn to 15", and to the approximate form of the finished case—a total draw of 9 inches, with no substantial change in diameter. Despite the severity of the draw, few pieces are torn or split in pres-



Fig. 12—Close-up of a V and O automatic trimmer which trims the ends of the shell cases between the third and fourth cold redraw operations.

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Piece-Part Control Speeds Up Tapping Operation — Provides Amazing Control over Accuracy of Work!



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2 ***Both hands free*** to feed parts—faster than by any other method! Operator stands comfortably balanced on both feet. It's not necessary to use the foot pedal.



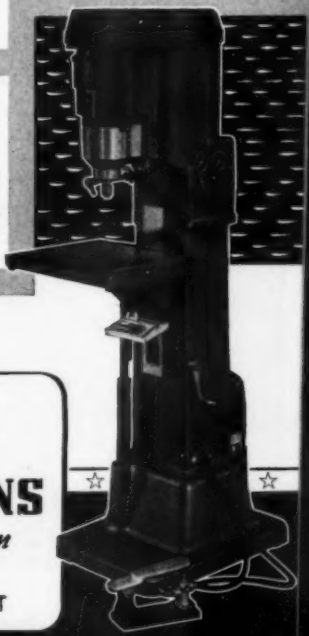
3 ***Air controls ALL tapping operation.*** Operator has only to feed parts. Air—at constant pressure—produces constantly uniform results.



4 ***Operators like it*** because they do better and faster work. Because rejects and tap breakage are less. Because it's easier on them—and on the machine.



5 ***Production and front office men like it*** because it turns out more—and better—tapped work at lower cost per man and machine hour.



Send For Tapping Tips—new literature devoted largely to critical war work. Contains many money-saving, money-making tapping ideas. R. G. Haskins Company, 624 S. California Ave., Chicago.

AIR Controlled

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Precision
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Fig. 13—Cold heading of the case in a press equipped with a two-stage indexing die, the lower die being built so that after the first stroke it can be moved across the press, bringing the second die impression under the punch carrying the case.

ent production. This may be partly due to a special drawing compound which was developed, the base material of which is machine oil.

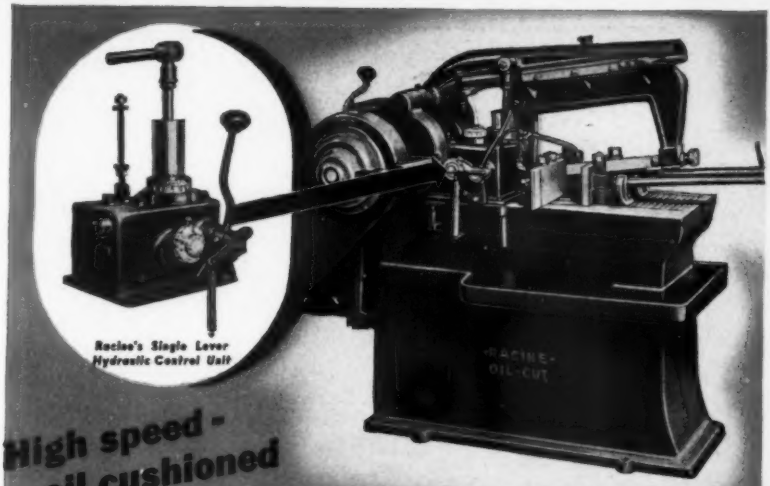
Between the third and fourth cold redraws, the ends of the cases are trimmed in a V. and O. automatic trimmer. (Fig. 12).

The next operation is cold heading of the case in a press equipped with a two-stage indexing die (Fig. 13), the lower die being built so that after the first stroke, it can be moved across the press, bringing the second die impression under the punch carrying the case. In these operations, the steel in the base is flared out so that the flange can be machined, the steel to fill this expanded rim being furnished by the extra thickness formed around the outer edge in the original hot cup.

Fig. 14 shows a critical annealing of the shell mouth, before tapering. Annealing is limited at the mouth end to a



Fig. 14—Annealing the shell mouths, before tapering. The cases on the conveyor move between two rows of 2-1/2" radiant gas burners, mounted in a furnace horizontally at the proper height to concentrate close-controlled heat on the mouths of the cases. Annealing, limited to about two inches at the mouth end, helps to prevent splits during tapering.



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Three-speed transmission for high speed production — Double Vise Jaws — Saw frame eliminates blade distortion — Adjustable Saw Guide. Other model capacities 6" x 6" to 20" x 20". There is a Racine Saw that will do your job. Complete information and prices on request. Address Dept. MT-S.



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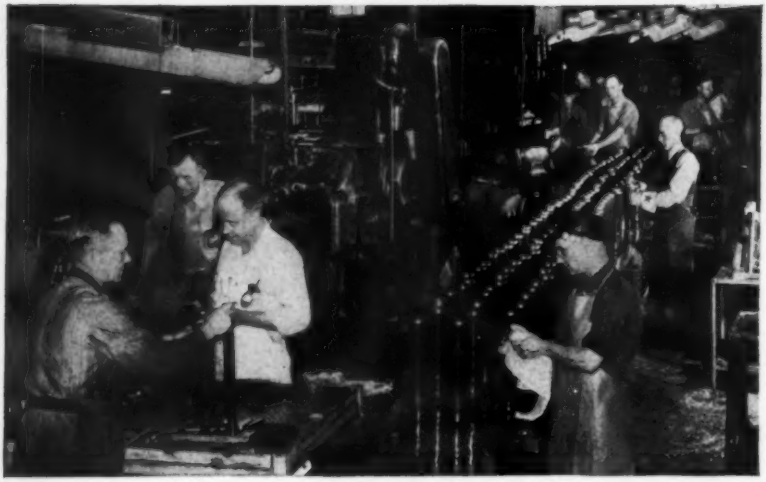


Fig. 15—A general view of the machining line, where shell case heads are faced, flanges formed and primer holes drilled, reamed and counterbored. Reaming and counterboring the primer holes are performed on vertical machines, to close tolerances.

depth of about two inches, to prevent splits during tapering. Temperature must be closely controlled. In this operation, the cases are mounted on a conveyor and moved between two rows of 2½" radiant gas burners. These are mounted in a furnace horizontally at the proper height to concentrate the heat on the mouths of the cases as they travel thru the furnace. The cases are rotated slowly as they move past the burners.

Tapering operations are also extremely critical since, in these two press operations, the cold steel must be made to flow into the desired taper without wrinkling or distortion, and without the support of a punch on the inside. The case is simply forced up into a tapered die cavity in two stages, both on the same press. The second stage does have a punch which extends about 3½" into the case. This is required, not for the over-all taper, but to support the metal in forming the reduced section at the mouth.

All punches used on the cold drawing and tapering operations are made of hardened high-speed steel, chromium plated. The plating has been found to improve the wearing qualities and to

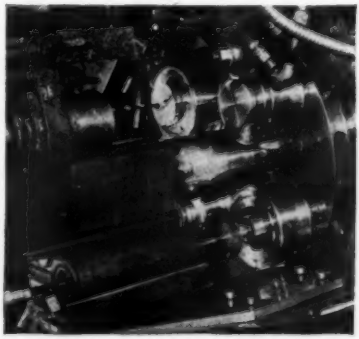


Fig. 16—A close-up of the Acme-Gridley which faces the heads of the shell cases, rough forms the flanges, finish forms the flanges and drills the primer holes. The automatic has five stations, four for the machining operations and one for loading and unloading.



Production at New Peak on

JOHANSSON GAGE BLOCKS

Deliveries on Priority Basis Now Being Made With Less Delay Than Formerly

REQUIREMENTS of extreme manufacturing precision in war industries of the United Nations have made unprecedented demands upon our output of Johansson Gage Blocks, and we regret that our customers have had to wait so long for delivery even though every order is on priority.

Today, we are happy to announce that increased manufacturing facilities have stepped up production to the highest peak in history and the period of waiting for deliveries has been greatly reduced. Yet production must always be limited by the accuracies to which these blocks are built. Even now, it is not possible to promise immediate deliveries. But it is smart to place your order now. If it is on file, your chances of getting early delivery are a great deal better than they have been heretofore.

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AND ACCESSORIES

Ford Motor Company, Johansson Div.
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World's Standard of Measurement



Fig. 17—Great care must be exercised in machining the steel shell case base, since specified tolerances are extremely close. Workmen are here shown gauging tolerances of machined bases, a critical inspection point.

provide better anti-frictional properties. Lower dies in the cold operations are generally steel rings with Tungsten carbide inserts on the working surfaces.

The mouth end becomes appreciably harder after the tapering operations, because of the cold working, so it is annealed once more, this time to a depth of about 3½" from the open end. This softens up the mouth and assures complete obturation in firing; that is, a tight seal in the gun barrel to prevent the explosion from blowing back into the breech.

The cases are inspected and transferred to automatic lathes which face the head, rough form the flange, finish form the flange and drill the primer hole (Figures 15 and 16). These lathes have five stations, four for the machining operations and one for loading and unloading. Reaming and counterboring the primer hole are performed on vertical machines, and great care must be exercised in these operations, since specified tolerances are unusually close (Fig. 17).

Final stress relieving is performed in a

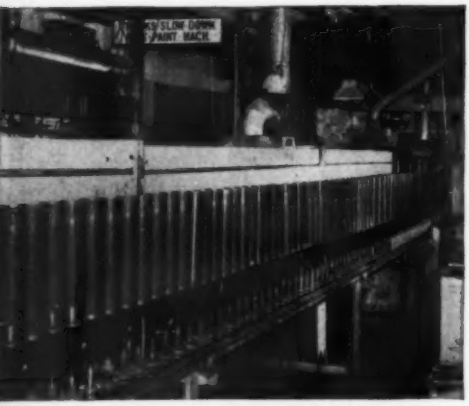


Fig. 18—The operation of coating shell cases with phenolic varnish and baking is fully automatic. This is a general view of the finishing line, with each case resting on a fixture, by means of which it can be rotated during spraying and baking.

Each twist of the wrist bites off a burr

Here you see one of the new Severance family of remarkably neutral deburring tools. With a twist of the wrist this Severance Hand Radius Deburring Cutter easily bites off the burr or sharp edge left by a drill or punch. It does not countersink the hole. Available in a wide range of sizes with radius or ball nose. Special shapes to meet your needs are available upon request. For prices and complete information about these money-saving, time-saving tools write to Severance Tool Industries, Inc., Saginaw, Michigan.



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batch-type electric furnace accommodating 316 cases. This heat treatment adds roughly 10,000 psi to the yield and ultimate strength of the case.

The coating which provides protection against corrosion and sparking, is an unpigmented baked phenolic varnish. Before painting, the cases are given a phosphoric acid pickling which provides a bond for the paint and also some additional protection against corrosion.



Fig. 19—A close-up of the finishing line. After passing spray nozzles to receive a coating of phenolic varnish, the upright cases are carried slowly between two banks of infra-red lamps and are thoroly baked for 48 minutes at 360° F.

The painting and baking operations are fully automatic, the cases being mounted vertically on a conveyor with the open ends up (Fig. 18, 19 and 20). They rest on fixtures attached to the conveyor chain so that as they pass the spray nozzles they can be spun by a motor-driven rubber belt. One spray nozzle is mounted on a traveling arm which descends into the case and lifts out at a uniform speed while the nozzle directs a spray of varnish over the rotating surface. At the same time, outside nozzles are positioned to coat the bases and walls thoroly and uniformly.

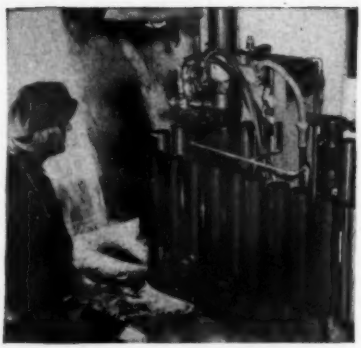


Fig. 20—This is the ingenious device for spraying shell cases with phenolic varnish, inside and out. One spray nozzle is mounted on a traveling arm which descends into the case and lifts out at uniform speed while the nozzle directs a spray over the rotating surface. At the same time, outside nozzles are positioned to coat the base and wall thoroly and uniformly.

Once coated, the cases are carried slowly between two banks of infra-red

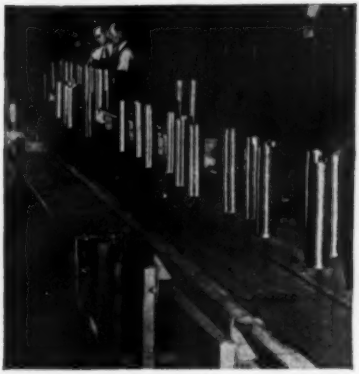
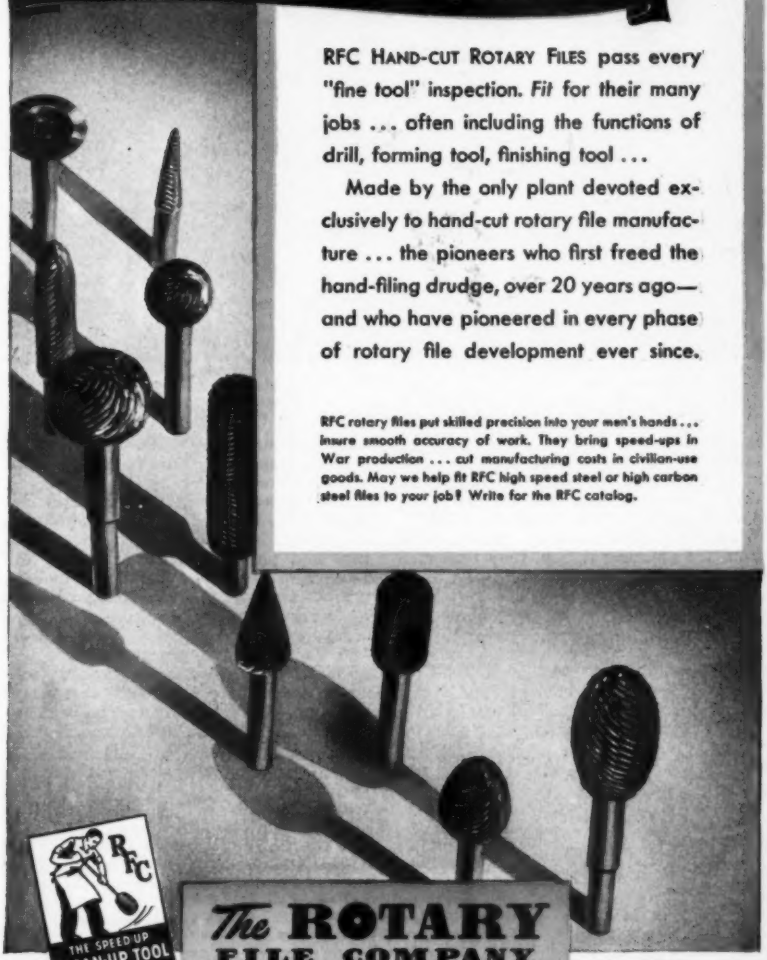


Fig. 21—A general view of the conveyor line down which completed steel shell cases move to inspection for final acceptance by the Ordnance Dept.

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The ROTARY FILE COMPANY
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Fig. 22—A close-up of the final inspection bench, showing some of the gauges used to check case dimensions. This inspection covers hardness, micro and macro examination, ductility, corrosion and abrasion resistance and ballistics properties.

lamps, 64 on each side. The conveyor loops twice at the end of the lamp bank, so that the cases travel three times thru the baking zone, requiring 48 minutes in a temperature approximating 360° F. When they emerge at the opposite end from the painting station, they pass thru an exhaust cooling station, where they are thoroly dry and cool enough to handle.

Inspection of the 75-mm steel shell case starts with receipt of the raw material and ends with final acceptance tests required by the Ordnance Department. This inspection can be divided into three classifications:—raw material inspection, process inspection, and final inspection for acceptance.

Raw material inspection includes determination of chemical composition, grain size, inclusion rating, macrostructure and physical condition of the bar stock with respect to mechanical defects.

Process inspection includes numerous dimensional checks, hardness tests and visual examination for physical defects which may occur in processing.

Inspection for final acceptance by Ordnance covers hardness, micro and macro examination, ductility, corrosion and ab-



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rasion resistance and ballistic properties.

One very unusual inspection tool has been developed to facilitate close inspection of the interior wall of the case. A cone-shaped piece of steel, slightly smaller in diameter than the case, is chromium plated to a mirror finish on the outer surface of the cone. A wire is attached to the apex of the cone and a small light arranged to illuminate the interior of the case and the bright surface of the cone. The unit is lowered to the base of a case and drawn slowly upward while the inspector watches the mirror surface. The inner surface of the case is reflected in magnified form, so that any surface defects are readily observed.

Test firing of production shells is carried out by the Army on a continuing basis. And thousands upon thousands of the once-impossible steel shell cases are rolling forward to the many battlefronts of the United Nations, to feed the standard 75-mm field pieces, at a saving of thousands of tons of critical copper.

While busy on their war task, it is safe to say that the automotive engineers who have accomplished this metallurgical feat are not overlooking the prediction of ordnance experts themselves, that the development "will make drastic changes in the manufacture of a multitude of items used in civilian life," once the war is ended, and "may give rise to new products which were never before available, because it was not known that steel of the type being used in shell cases could be so worked."

The Production Line Is The Lifeline of America

LIGHT WAVE MEASUREMENT

Descriptive charts, illustrations, diagrams and detailed instructions that should go far toward simplifying understanding of light wave measurement have been prepared in a booklet by Acme Industrial Co., 210 N. Laflin St., Chicago.

It explains practical, everyday uses of light waves in shop measurements, based on Acme's experience in its own shop. Any mechanic it is claimed, can measure in millionths of an inch by following the instructions outlined in the new booklet.

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Monarch lathe, equipped with automatic sizing, turns these shafts *automatically*. Similarly, step boring and facing, contour facing, boring and turning, and other combinations of straight and taper turning, can be done fast and accurately. Production is increased, unit costs are cut, and men and machines released for other work.

THE MONARCH MACHINE TOOL



the saving in time, and increase in production, can readily be appreciated.

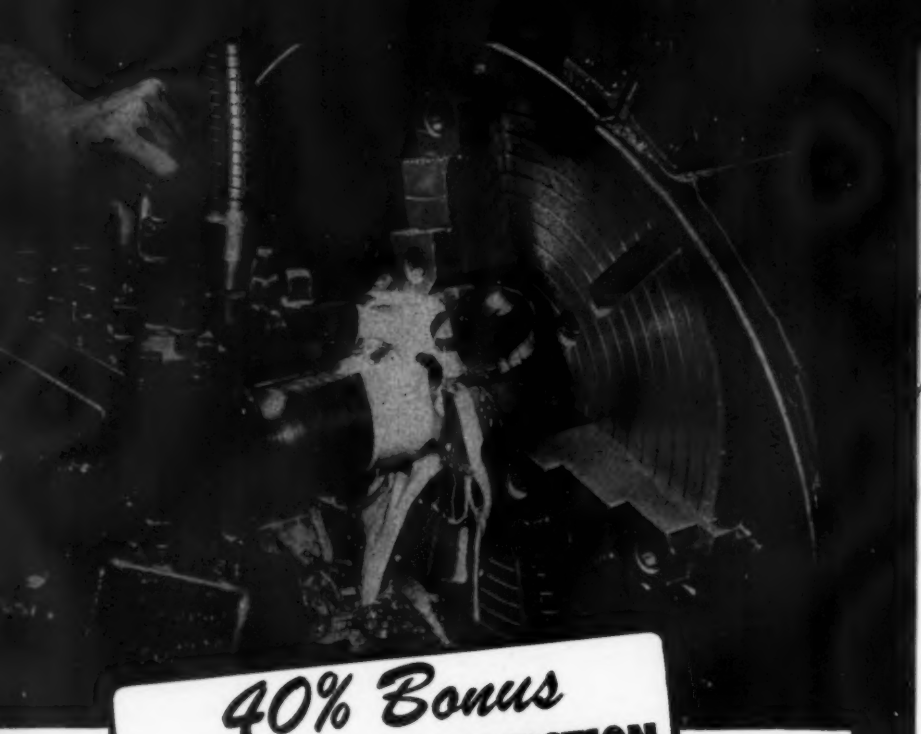
Automatic sizing converts a standard Monarch lathe into an automatic engine lathe, for mass production of a wide range of turning, boring and facing operations, all within the required limits of accuracy. One operator can easily run two or three machines, thus again helping to increase output, in the present emergency.

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SUNOCO EMULSIFYING CUTTING OIL

prolongs tool life...improves finish...increases production

The longer cutting tools last on the production lines ... the more vitally needed war material can be produced for the fighting line.

The value of the right cutting oil in prolonging tool life was amply proved by a large manufacturer of war material. When using a competitive cutting oil production was seriously slowed down because of short tool life ... poor finish ... and bad operating conditions. Then he switched to Sunoco Emulsifying Cutting Oil on his Warner & Swasey turret lathes. The high heat absorbing lubricating qualities of Sunoco stopped the trouble. Results ... tool life and production stepped up 40% ... finish on parts greatly improved.

From metal working plants large and small on America's production front reports such as these are constantly being received. Facts that prove why the majority of metal working plants flood their tools and work with Sunoco to get more pieces between tool grinds, reduce rejects, and make every man-hour and machine-hour result in peak production. Call in a Sun Doctor of Industry, let him prove the production value of switching to Sunoco in your own plant. Write

SUN OIL COMPANY, *Philadelphia*

SUNOCO

UN INDUSTRIAL PRODUCTS

HELPING INDUSTRY HELP AMERICA

EXTENDING TOOL LIFE

By W. L. KENNICOTT*

Steel cutting carbide tools are war weapons. You can help the war effort and increase tool life by following proper grinding methods.

IN order to conserve tools, (of which there is no oversupply,) proper consideration should be given to methods of grinding steel-cutting carbide tools. Improper methods produce structural weaknesses in carbide tips which are not characteristic of the cutting composition itself. This structural breakdown takes the form of cracks or checks in the carbide and often makes the tool appear to be inherently weak.

Carbide tools can be protected from breakdown on the job, due to cracks or checks, by properly wet grinding them when resharpening becomes necessary.

Avoid dry grinding methods whenever possible, particularly on tools larger than ⅝" square. If a quantity of tools can be ground at one time, it is possible to dry grind each one a short time and lay it aside to cool, but a great deal of time is lost and, frequently the urgency for getting a particular tool finished results in grinding it with insufficient cooling periods, and the tool is cracked or checked. When cracked tools break down in the machine, the regrinding requires considerable stock removal instead of the few thousandths usually necessary in resharpening. The additional grinding further ties up the grinding room, and the heat put on the tool grinders often results in heat on the tools, further aggravating conditions. In other words, dry grinding is possible but not usually practical.

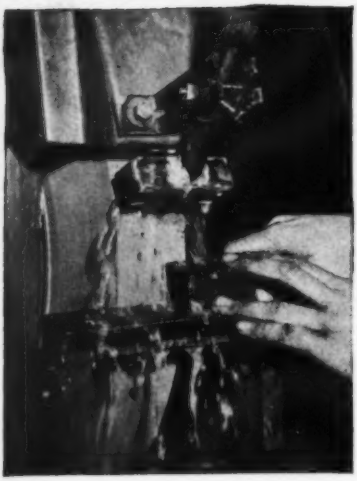
In addition to eliminating tool damage from checking, wet grinding is faster than dry, permits the use of more durable wheels, and washes away abrasive dusts. Frequently wet grinding will eliminate a finish grind on large roughing tools since 80 or 100 grit wheels running under coolant produce a fine enough cutting edge for most jobs.

Rough Grinding

Rapid grinding is possible on large green or grey grit special loose bond silicon carbide wheels, using a water



*Toof Engineer, Kennametal, Inc. Latrobe, Pa.



coolant with enough sal soda to make an alkaline solution and prevent rusting of the machine. A 60-grit soft bond wheel of as large a diameter as possible should be used. A 20" diameter straight wheel is preferred for rough grinding the usual run of large tools such as are used in machining shells and other armament.

The coolant should cover the entire working face of the wheel and make contact with the wheel just above the tool. An ample flow should be provided, not a jet or spray. A spur wheel dresser should be used frequently to keep the new silicon carbide crystals exposed. An experienced operator can keep the wheel dressed with the tool being ground, by maintaining a constant movement of the tool back and forth across the wheel as well as rocking the tool in both directions. Alternate light and heavy pressure should be used in order to break the silicon carbide crystals and thus maintain a sharp, free cutting wheel. The flow of water, hardness of the wheel bond, and other grinding conditions should be such that the tool, pulled rapidly away from the wheel while grinding, should not feel warm when touched with the finger.

To permit rocking the tool in all directions during the roughing operation, a narrow tool rest (approximately 1½") should be used. This rest may be set at an angle about 2° to 3° more than the clearance angle required, thus permitting a final pass over the wheel with the tool held on the rest, to true up the angles for finished grinding.

Finish Grinding

For finish grinding of steel-cutting carbide tools, a large cup wheel between



The illustration on the preceding page showed the operation of rough grinding the tool side. At the upper left of this page, the operator is shown rough grinding the tool top. In the view shown at the left, the tool end is shown receiving a finish grind. All of these are wet grinding operations.

THE KNIGHT MILLER

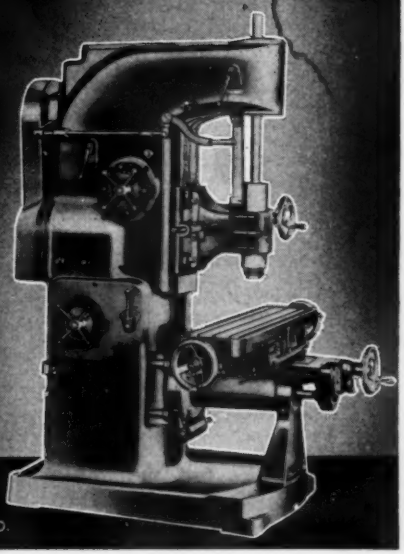
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90 and 120 grit on a wet grinder is recommended. Keep the tool moving back and forth across the wheel, since the large tool rest used to true up the angles does not permit rocking the tool. Dressing the wheel with about 1/32" of crown in the center of the face decreases the area of contact and permits better cooling. If the finishing must be done dry, be careful to keep the wheel sharp enough so that no heat coloring shows on the tip or shank steel at any point.

In finish grinding it is best to use the face of a cup wheel as shown. The top of the tip is ground first, setting the table rest at the finished side rake angle desired.

To grind the end of the tool, set table rest at the finished front clearance angle desired. If the clearance on the tip is made 2° to 4° less than the clearance on the shank, the wheel contact will be on the carbide tip only, reducing the grinding time and preventing the wheel from "loading up" with steel.

Grinding the side clearance and side cutting edge angles is the last step in finish grinding tools. As in roughing, wet grinding is preferred.

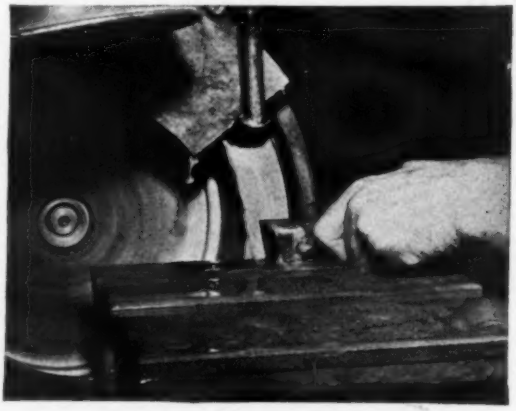
Tool radius is formed by rotating the tool from the side cutting edge to the end cutting edge, blending the radius tangent to the side and end cutting edges.



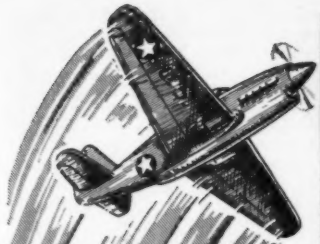
Diamond impregnated bakelite wheels of 220 grit are very satisfactory for finish grinding. Honing sometimes will increase tool life on light cuts.

Rigid Grinding

When grinding steel-cutting carbide tools in a magnetic chuck or rigid fixture,



In the upper right on this page, the operator is shown rough grinding the tool end. In the view at the right, finish grinding of the tool top is shown. In the illustration on the following page, the operator is applying the finish grind to the tool side. These operations are also shown subsequently in line drawings.



Getting 'em into the air FASTER

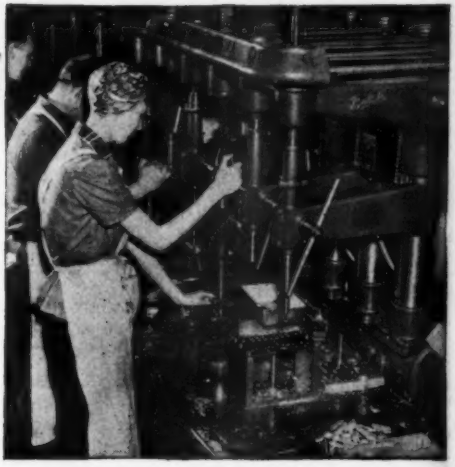


Photo Courtesy Curtiss-Wright

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"Buffalo" **DRILLING MACHINES**



resinoid bonded diamond wheels of high concentration are recommended.

A light vertical feed per pass is advisable to insure long wheel life and freedom from checks in the tool. The diamond grit is harder than the carbide and will cut it if passed across the carbide surface, but the wheel bond is much softer than the carbide and must be "protected" by its studding of diamond particles. A 100 grit wheel has grains of about 4½ to five thousandths mean diameter, which must be imbedded at least ¾ of that distance in the bonding matrix, leaving less than one thousandth of "cutting edge" projecting. Just as the tool with a ¾" long tip would not be used on a 1" deep cut, a wheel with .001" maximum "cutting edge" length should not be used on a "depth of cut" over .0005" if allowance is made for some wear of the diamond grains.

Fortunately diamond wheels cut carbide readily at high table speeds, so that the combination of .0005" feed per pass, with a rapid table motion, results in fast grinding.

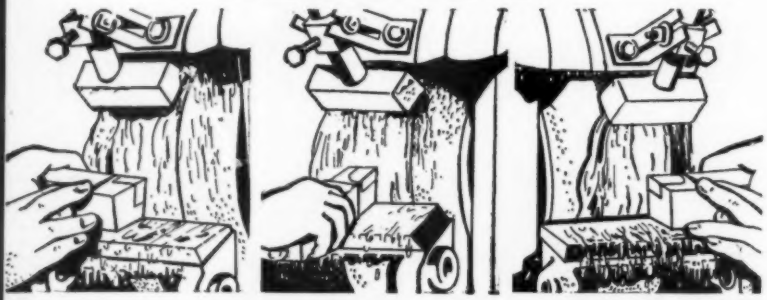
Improper Grinding Weakens Tools

Breakdown of a crazed tool usually occurs while in the cut and sometimes appears to have broken from too high a cutting pressure. Since this type of crack seldom can be seen, even under fairly high magnification, and since breakage occurs while the machine is being operated, even the most experienced men fail at times to diagnose the correct reasons for such tool breakdowns.

Several things may cause tool breakdown:

The crazing and subsequent weakening of a tip surface may be caused by suddenly overheating the tip surface while the interior remains cool. Checking or

ROUGH GRINDING OPERATIONS



TOP END SIDE

6 STEPS TOWARD TOP PERFORMANCE, WITH CARBIDES, WHEN YOU *CUT STEEL*



● Important in getting top performance, when cutting steel with carbides, are the six steps shown above. When correctly applied, carbide tools produce results far surpassing the performance of ordinary tools. They operate at machine speeds as high as 4 to 5 times faster than ordinary tools, stay sharp up to 10 times longer, and increase output often as much as 300%.

Important, too, is the carbide you use. When you select from the complete line of carbides produced by Carboloy Company, you get the best type for your particular job—whether it be the popularly designated "titanium carbides", "tantalum carbides", "tungsten carbides"—or "tri-carbide" grades.

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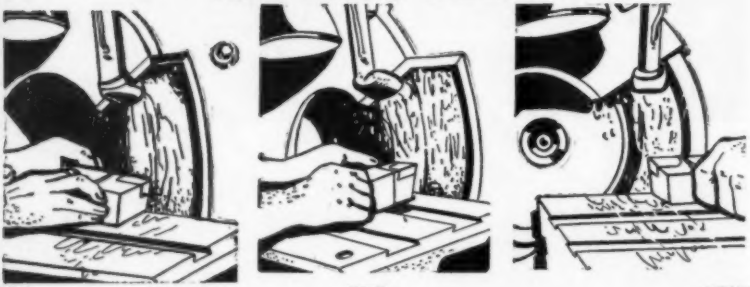
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TITANIUM - TANTALUM TUNGSTEN - CARBIDES

FINISH GRINDING OPERATIONS



TOP END SIDE

crazing may therefore be caused thru the use of any alundum wheel, a silicon carbide wheel of tool hard a bond, or a low concentration diamond wheel. A tool crazed on the broad top surface of the tip will sometimes lose a section back of the cutting edge where there is apparently no strain.

The second larger crack is caused by a difference in the expansion of the steel shank and the tip, and usually appears parallel to a brazed surface and near to it. Such cracks usually are caused while snagging away the shank steel below the tip. When a tool shank becomes blue from the heat of grinding, a crack probably exists in the tip, altho it may not show up until the tool is in use. This type of crack can be caused also by too rapid cooling of the tool after grinding, or by an interrupted flow of coolant while cutting.

Grinding with diamond wheels should be restricted to the carbide insofar as possible, as the comparatively soft steel shank loads up the wheel, necessitating frequent dressing and causing more rapid wheel wear.

A good grade of diamond wheel, properly used in grinding cemented carbide, has a suprisingly long life.

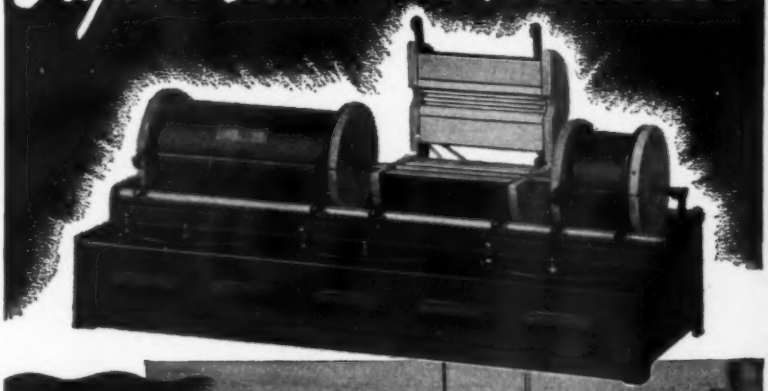
Thermal Strains

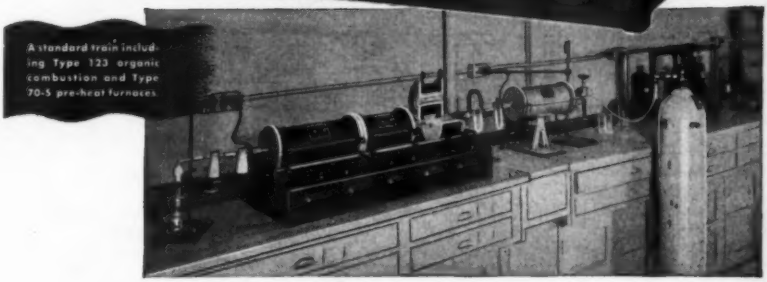
Steel-cutting cemented carbides have approximately half the thermal expansion rate of the steel shanks to which they are brazed. This creates excessive tensile strains in the carbide, when both tips and shank are heated equally. When the steel is being roughed away under the tip, the condition is even worse, as the steel is at a higher temperature than the carbide.



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Steel-cutting cemented carbides also have a lower heat conductivity than cast iron-cutting grades. In cutting this is an advantage, as it throws the heat into the steel chips, but during grinding, care must be taken to avoid overheating an edge or surface while the balance of the carbide is cooler. Such localized heating tends to tear the overheated surface away from the mass, causing a network of fine hair-line cracks or checks.

The logical way to prevent either of these types of thermal strain is to keep the surface that is being ground, cool at all times, by the use of an adequate flow of coolant on the tool and wheel. The flow must be adequate, however. A dry grinder is not desirable, but a "damp" grinder is much worse.

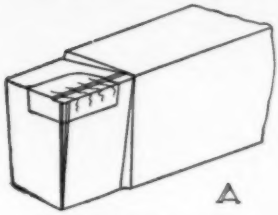
How To Avoid Cracks and Checks

Follow these grinding instructions to get full life from your steel-cutting carbide tools:

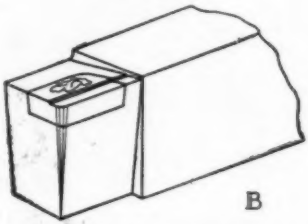
(1) Always wet grind the tools at 4300 to 5500 sfpm.
(2) Use a 60 grit silicon carbide soft bond wheel for roughing and 90 to 120 grit wheel for finishing.
(3) Keep wheels dressed with a star dresser.
(4) Use sufficient coolant in full, steady flow.
(5) Constantly move tool back and forth across the wheel.
(6) Use resinoid bonded diamond wheels when grinding in a rigid fixture or magnetic chuck.

(Photos—Courtesy McKenna Metals Co.)

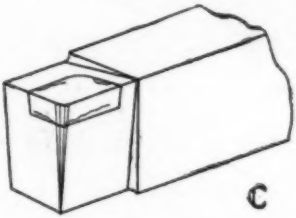
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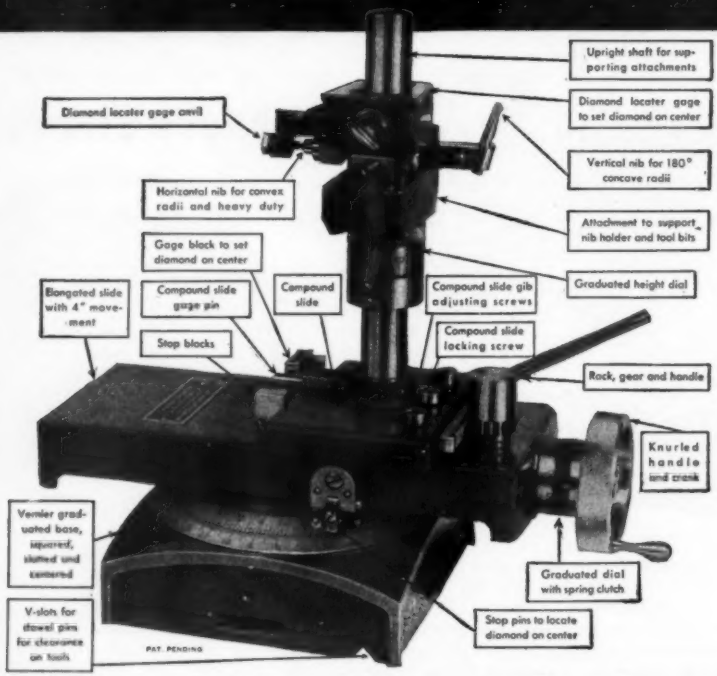
From this reproduction of an unretouched microphotograph, you can see the patented (No. 2027039) "Wavy Rows" in which NUCUT teeth are positioned. It is this feature that enables the NUCUT file to cut deep and finish smooth, both at the same time.



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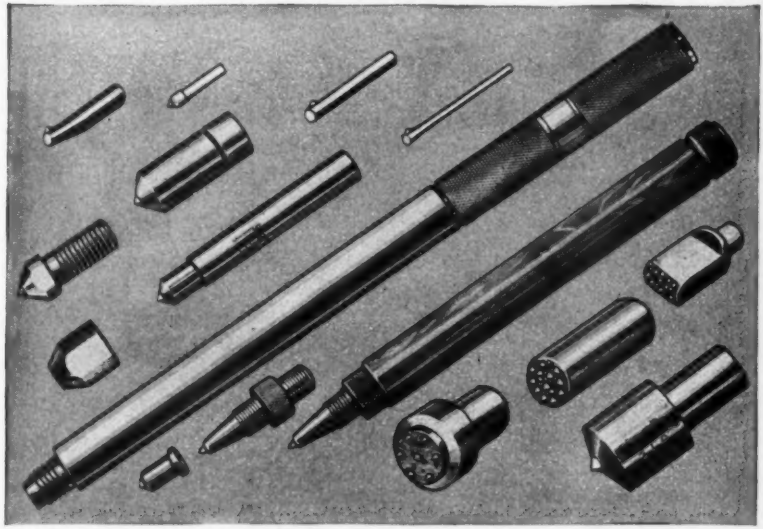
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What tool life can be expected?
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How do you set up to shave different gear types?
What controls gear accuracy in "gear shaving"?
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Producing Small Machine Tools

PART III—CARRIAGE APRON, MILLING MACHINE TABLE AND LATHE LEAD SCREW

By H. A. FROMMELT*

THE carriage apron, as assembled on the Atlas Lathe, in its general appearance and functioning, is evident from Fig. 1.

The operation to be performed, which will be discussed, is the boss on inside of the carriage apron. On this surface is located a support bracket for the lead screw bearing. The surface, or boss, under consideration, is clearly visible in the finished carriage apron shown in Fig. 3.

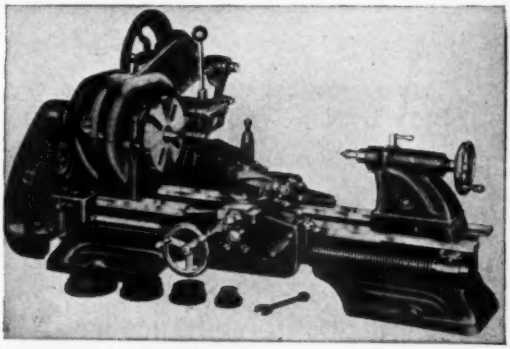


Fig. 1—Atlas "F" series 10" Backgeared Screw Cutting Lathe with instantly reversible power cross feed and power longitudinal feed.

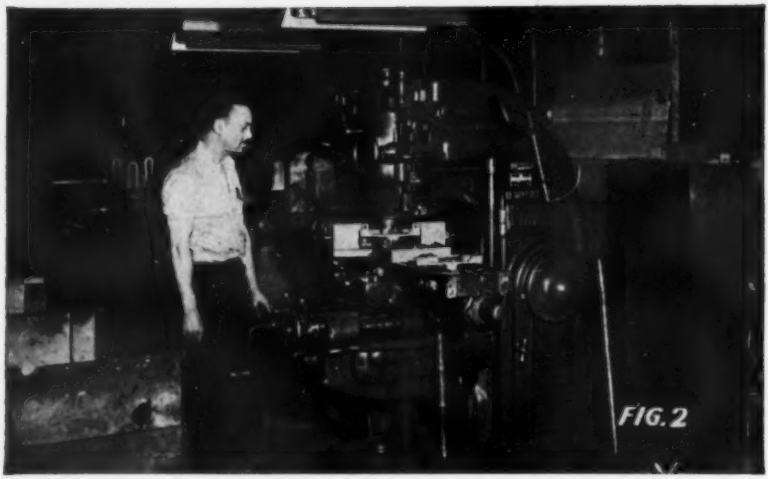
The equipment used for this purpose is a standard No. 2 Vertical Milling Machine, equipped with a fixture, the details and functioning of which are clearly visible in both the general view, Fig. 2 and the close-up of the setup, Fig. 3.

The carriage apron, or workpiece, is located in the fixture, (See Fig. 3) from the top and front surfaces which have been milled previously. The fixture is clearly visible in this illustration (Fig. 3), and its construction and functioning are immediately obvious. A screw type of plunger forces the carriage apron against the jaw to the right and holds it firmly. The screw jack is brought into position to support the underside of the casting properly, thus effectively counteracting the downward spindle thrust. Since the table of the milling machine is fed to the left, the horizontal cutting pressures are directed to the left.

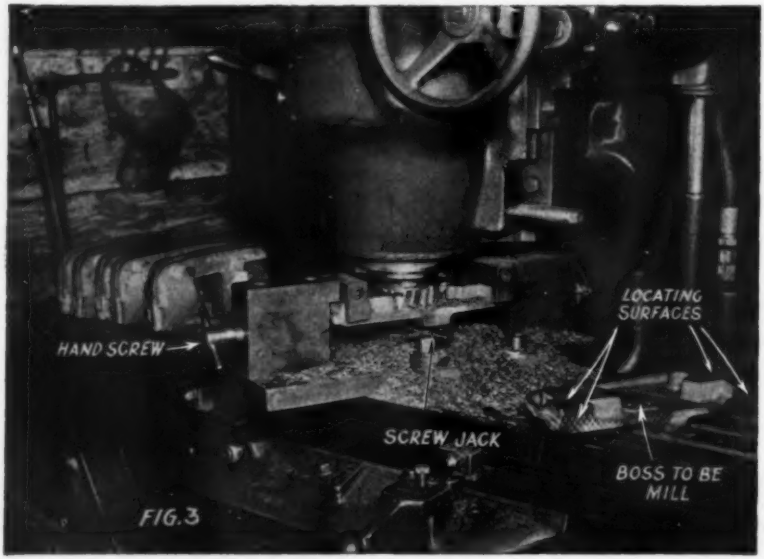
The fixture is clamped to the table at an angle, as shown in Fig. 3, so that the half-side milling cutter can remove stock from behind the front boss.

The three-inch, high speed, half-side milling cutter on the vertical spindle revolves at 145 rpm. The linear velocity of this cutter, revolving at 145 rpm is 108 fpm, which is in the upper bracket for the milling of cast iron with a super high speed steel cutter. Since the feed rate at

*Director of Industrial Research, Kearney & Trecker Corp., Milwaukee.



General View (Fig. 1—above) and Closeup (Fig. 2—below) of setup for milling Lathe Carriage Apron.





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which the workpiece is being fed into the cutter is 3-11/16" per minute, the chip load is two-thousandths of an inch plus.

The production rate under these conditions is 25 pieces per hour. Only one cut is taken on this workpiece, 1/16" deep. There is no finish milling cut and no final finishing operation. Thus, less than one minute is required to completely mill the base of this boss, leaving approximately 1½ minutes for the unloading and loading time.

MILLING MACHINE TABLE

The Atlas Milling Machine, shown in Fig. 4, is equipped with a complete V-belt drive, and a quick change counter shaft (attached to the machine). It has a precision ground table for which there are three types of table controls available:—Hand operated screw feed, rapid production lever feed, and a "Change-O-Matic" for the instant selection of reversible automatic longitudinal table feeds between 0.162" and 9.125" per minute. The spindle is equipped with Timken tapered roller bearings and this machine tool can be equipped with swivel vise, rotary index table, indexing centers and coolant system.

The table working surface is 4½ by 18"; the longitudinal table travel is 12"; the vertical table travel 6"; the arbor diameter is 7/8"; there are 16 spindle speeds between 54 and 3,225 revolutions per minute; the spindle is 1" in diameter and the nose is bored for a No. 2 Morse Taper.

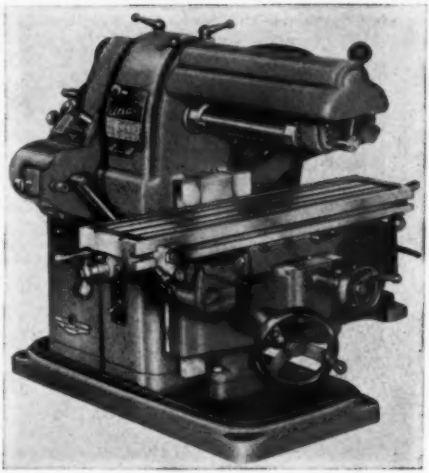




Fig. 4 (top righthand corner of page) presents the Atlas Milling Machine. Fig. 5 (left) is a general view of setup for producing the milling machine table. Fig. 6 on a succeeding page shows a closeup of the operation.



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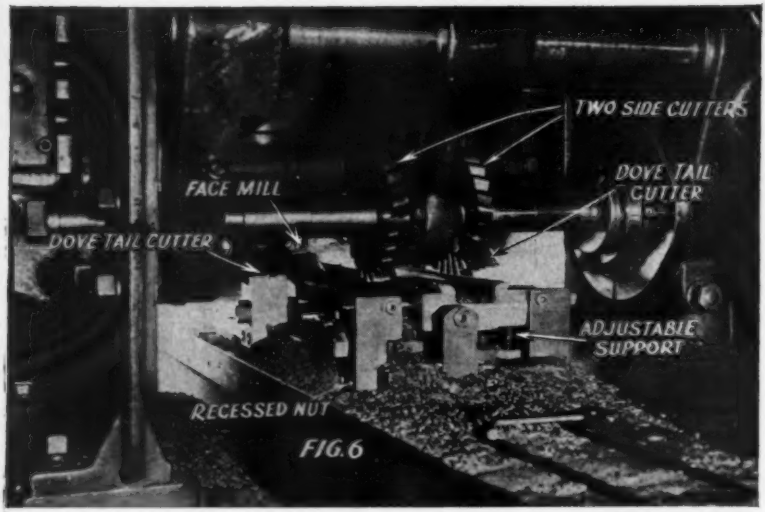


FIG. 6

The overall dimensions are 25½ by 32½ by 22" high; a 1/3 horse power motor, operating at 1740 rpm, is recommended.

These specifications indicate the nature of this machine tool. It is a piece of precision equipment, sufficiently flexible to produce high quality work within its range. The machining operations to manufacture this equipment must be set up to produce in quantities sufficient to meet its price level. Also to assure that the parts, when assembled, will constitute a piece of precision machine tool equipment.

The present discussion will be restricted to the milling operations necessary to machine the bottom and dovetail the milling machine table.

Five cutters are required to mill these surfaces:—Two half-side milling cutters on the horizontal spindle to remove stock for the dovetailing operations; two dovetail cutters, one on each of two vertical spindles, (Fig. 6) and one face mill on a rear vertical spindle.

The general machine setup for these operations is shown in Fig. 5. A bed type machine equipped with special horizontal and vertical spindles mills these surfaces of the milling machine tables. The same machine is used for milling of the lathe carriage described previously. The horizontal spindle is set in a head (See Fig. 5), which can be adjusted vertically. Likewise the bridge which carries the vertical spindles. In addition, the vertical spindles are equipped with a necessary cross-wise adjustment to accommodate the various sizes of workpieces, ranging from the lathe carriage to the milling machine table.

The milling machine table, or workpiece, is located with its top set in the base of the fixture. Its positioning is accomplished by four supports, three of which are fixed and one is adjustable. Some of these supports are visible in Fig. 6. The casting is clamped by two recessed type nuts on the side of the fixture, also visible in Fig. 6. One end of the table bumps against the vertical stop for accurate positioning, as shown in the close-up illustration, Fig. 6.

The two half-side milling cutters on the horizontal spindle, used for roughing ahead of the dovetail cutters, are of high speed steel and revolve at 76 rpm. The two dove tail cutters on each of the two for-



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ward vertical spindles are also of solid high speed steel and these likewise revolve at 76 rpm. Finally, the face mill used for milling the bottom of the dove tail section, which is set on the rear vertical spindle, revolves at 76 rpm. Since the two half-side milling cutters are 6" in diameter and revolve at 76 rpm, the linear velocity is 87 surface feet per minute. The diameter of the dovetail cutters is 6", which at 76 rpm likewise gives a linear velocity of 87 feet per minute. The face mill cutter mounted on the rear spindle is 4" in diameter. Since this revolves at 76 rpm, its linear velocity is 78 feet per minute.

The table casting, of cast iron, is fed into these cutters at a rate of 8.4" per minute. The chip load per tooth of the various cutters is, therefore:—Half-side cutters, .0046"; dovetail cutters, .0046"; face mill cutter .006".

The arrangement as presented in this discussion makes possible, in spite of the precision demanded, a production rate of 7.8 pieces (or milling machine tables) per hour.

THE LATHE LEADSCREW

The milling of full length keyways on the leadscrew for the Atlas Lathe presents some interesting points for discussion.

The details of this leadscrew are shown in the drawing, Fig. 7. The overall machine setup for milling of these keyways is shown in Fig. 8; a closeup of the fixture, setup and cutter assembly is presented in Fig. 9.

The keyways are ⅛ by .130 by 47" and must be milled without a burr. A bed type, single head, milling machine was chosen for this operation. The table of this machine is 18" wide by 72" long and has a table travel of 54". The necessary vertical adjustment in the spindle can be made by raising or lowering the spindle block, for which the vertical slots as shown, are provided. The crosswise adjustment is accomplished by moving quill which carries the spindle, in or out. This machine is equipped with a 7½ hp motor and is, therefore, capable of removing a considerable volume of metal per minute. Hence, the milling of the keyways in the four lead screws in one pass is easily within range of this equipment.

The four keyway cutters, made of high speed steel, are ⅛" thick and 6" in diameter. The assembly of these cutters on the arbor is clearly presented in Fig. 9. The large bushings between cutters strengthens these relatively fragile cutters and makes for greater rigidity in the setup.

The fixture, as is evident from Fig. 9, is made to hold four screws at one time and the keyways are cut simultaneously. Each cutter is serviced by an oil line on the right or front side, and an air line on the left side, to remove the chips from the keyway. If these chips are not removed, cutter teeth are broken when the table is reversed. Moreover the keyway millers are likely to spring away from

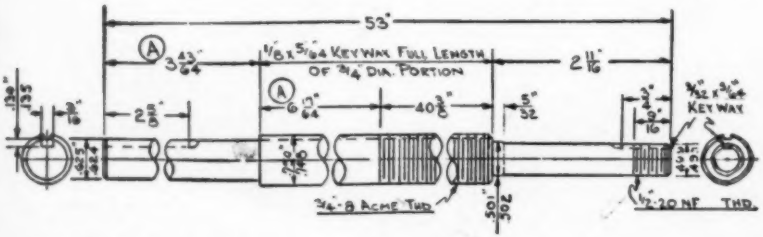


Fig. 7—Details and dimensions of Lathe Leadscrew.

NOTE:—
USE ONLY A VERY SHARP KEYWAY CUTTER. ALL BURRS IN THREADS AND KEYSEAT MUST BE CAREFULLY REMOVED WITH WIRE BRUSH WHEEL & FILE.



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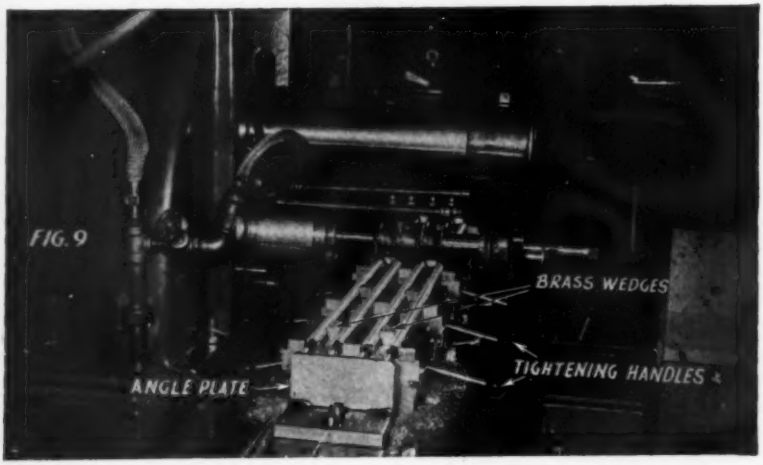
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the lead screw, thus resulting in an inaccurate job and poor finish.

Climb milling is properly called for in this operation which prevents formation of a burr on top edge of keyway. Since the cutting edges of the keyway cutters enter lead screw at top of the keyway, during the cutting process, the cut will be clean and sharp. If conventional milling were used for this operation, the cutter teeth would leave the leadscrew at the top of the keyway. This means that the cutting edges of the keyway miller would carry metal along with them, resulting in a burred edge on top of the keyway.





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The fixture used for milling these keyways on the leadscrews is an interesting example of a simple, yet effective arrangement for holding the four leadscrews, in order to mill four keyways in one pass.

The fixture consists of five individual clamping units and an angle plate. Each unit has two brass wedges, which are pulled down between the screws by means of handles. These handles extend over the sides of the table, and are clearly visible in Fig. 9. The wedges just mentioned, are also clearly visible in this illustration, Fig. 9. The angle plate is clamped to the left end of the table and acts as a stop, preventing movement of these workpieces. In Fig. 9, the table is moving to the left, or towards the observer, while the cutters are revolving clockwise, that is, the bottom teeth on the cutters are coming out towards the observer. Hence, the tendency in this setup is to move the leadscrews to the observer, or to the left. The angle plate is therefore necessary to prevent this movement.

Speed of the spindle, (or the cutters) is 200 rpm. The feed rate is 10½" per minute. Under these conditions, the production rate is 40 per hour. It is interesting to note that before this arrangement for machining the keyways was determined upon, the production rate was six per hour.

Depth of the milling cut is .130" Only one cut is taken on these keyways and there is no final finishing operation. Whenever burr is present, in spite of the climb milling process, it is filed by hand.

(To be continued)

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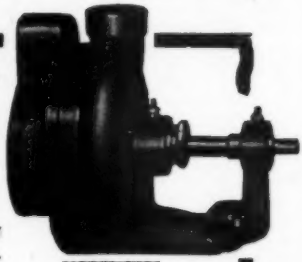
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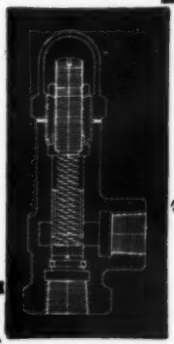


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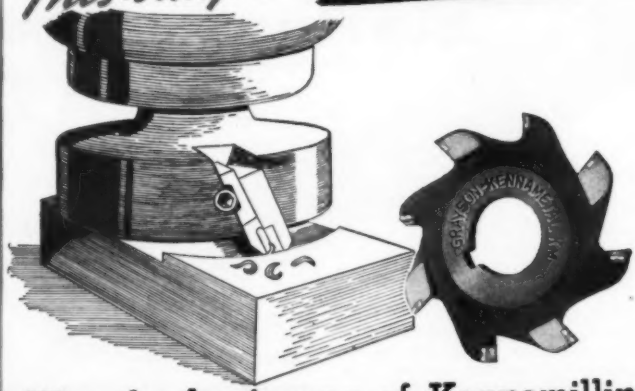
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Declaring that tool breakage is one of the most critical factors in industry today, Howard Coonley, Director of WPB Conservation Division, calls upon industry to establish definite tool care policies within individual plants.

"Unless industry cooperates in reducing this abnormally high breakage by training its employees in the proper method of handling cutting tools, serious production effects may result, and the present shortages of tool metals will grow even more dangerous."

Mr. Coonley's statement signalled the beginning of concerted action by the various divisions of WPB to effect greater conservation thruout industry in the use of cutting tools.

Altho many plants have encouraged tool economy in varying degrees in the past, tool conservation thruout industry now becomes an emergency "must". If machine tools are to be supplied with the cutting edges they need to keep up the pace of war production, metal-working firms large and small must establish plant-wide conservation programs as a matter of management policy.

Cutting tools employ the most critical alloying metals—tungsten, molybdenum, cobalt, vanadium and chromium. The greater part of our supply of these metals is obtained from foreign sources. For the most part these supplies cannot be materially increased during the present conflict.

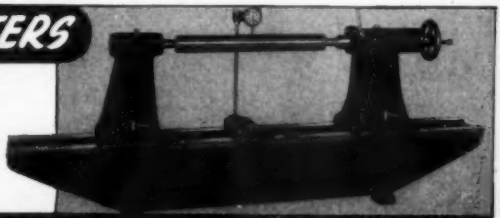
Coupled with this shortage of tool material is the fact that over nine million workers are now using cutting tools for the first time.

Government specialists in the Conservation Division and Tools Division say that there is a high degree of breakage and spoilage of cutting tools on the part of green workers, largely because so many of these people have been necessarily put on the job with only a minimum of operational training. Therefore it has been difficult for many plants to impress tool workers sufficiently with the importance of tool care. Hence, the WPB is projecting, thru several channels a program to encourage a greater appreciation of tool values among workers, and an expansion of tool conservation education and training on the part of management.

The primary recommendations of the Board are that plant training programs include tool conservation as a definite subject in the curriculum; that tool con-

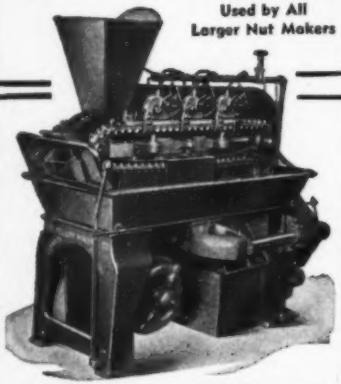
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servation be placed upon a plant-wide policy basis—applying to every person who handles tools and organized thru a group representing both worker and management personnel; that tool manufacturers and other industrial advertisers feature the importance of tool care in their messages and campaigns.

It is emphasized that a tool care policy within a plant will not be effective unless it is practiced by all who handle tools. If only one out of every three or four workers handle tools correctly, the program will not be successful, and will soon break down. Therefore, a uniform plan is essential.

The NIAA is assisting in the campaign, and will handle ia as an Association project thru its chapters located in 26 industrial centers thruout the country. Plants where labor management committees are organized will develop the project thru channels arranged by the War Production Drive Headquarters. WPB training specialists are asking municipal and state training directors to establish the program in connection with their courses for people who will go into industry for the first time.

A limited amount of graphic material will be available including three-color posters, small stickers, and news material for employees magazines. The WPB Division of Information will be available for special assistance and data on the subject for use in connection with special plant campaigns. The campaign slogan "Tools are Weapons-Treat 'Em Right" will be featured on all printed matter and plant campaign chairmen are requested to use it in connection with their local promotions.

One of the most important phases of the campaign is the program to encourage the tipping of high speed tools. By reclaiming sections of broken or spoiled cutting tools by welding or brazing them to soft steel shanks, our supplies of high speed steel can be greatly extended. Much editorial material has been published on the various methods of tool tipping, but in order that the reader may see at a glance the apparatus and materials needed and the various steps of procedure under these different methods of welding and brazing, WPB has issued a chart on

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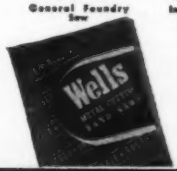
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WELLS MANUFACTURING CORPORATION

Wells METAL CUTTING BAND SAWS

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We are proud to announce that we have been awarded the coveted Army-Navy "E" in recognition of the quality and quantity of the Universal precision parts we have been producing for the war effort. We are also glad to announce our new Universal Mikrolok, the boring bar which can be quickly adjusted like a micrometer to limits of .0005 or less. Write for catalog.



UNIVERSAL ENGINEERING CO.
FRANKENMUTH MICHIGAN

approved methods of tool tipping. This official chart is published in support of the government's tool conservation campaign.

BRAZING

LOW TEMPERATURE

This process is especially adapted to the requirements of high speed steel.

Apparatus: An oxyacetylene welding torch. A vise or jig in which to hold the tool in a convenient position.

Material: A silver brazing alloy shim of proper thickness, usually .003" to .008", with a melting point of 1175° F. maximum. A flux of a type that will dissolve oxides found on high speed steel, and which will be fluid and active at brazing temperature. A good grease solvent.

Procedure for hardened high speed steels:

1. In joining an inserted tip to a shank, machine or grind a recess in the shank to match the tip.
2. Make sure that the surfaces of both recess and tip which are to be brazed are fairly smooth. A milled surface or equivalent is satisfactory.
3. Clean all surfaces to be brazed with a good grease solvent.
4. Place the shank in the vise or jig with the recessed end projecting.
5. Coat the recess and the tip with flux.
6. Place the shim of silver brazing alloy on the entire recessed surface to be brazed.
7. Place the tip of the shim.
8. Apply heat with the oxyacetylene torch. The flame should be neutral or slightly reducing.
9. Direct the flame to the underside of the shank below the recess, moving the flame back and forth to distribute the heat evenly. Heat the shank until it becomes a barely visible dull red.
10. Withdraw the flame to a greater distance from the work and continue heating until the brazing alloy melts, keeping the temperature as low as possible in order to avoid drawing the temper from the tip.
11. Make sure the alignment of the tip is correct.
12. Press the tip firmly into place. Maintain the pressure until the brazing alloy has solidified.
13. When the brazing alloy has solidified as determined by eye, immerse the tool in oil long enough to set the braze, then cool in air. The hardness along the cutting edge should be comparable with that of solid hardened high-speed tools.

PROCEDURE for butt joints, etc.

In joining a tip to a shank when a notch is not used, such as in the case of a butt joint, the procedure is similar, except that additional care must be taken to make sure that the alignment is accurate.

HIGH TEMPERATURE

This method is used for tipping with annealed high-speed steel.

Apparatus: A high heat furnace of the type used for hardening solid high speed tools, or for brazing tungsten carbide bits; it is advantageous, although not necessary, to have



.0001" Tolerance on 4 Sides

In one modern Pennsylvania plant, keys ranging in size from ¼ to 1⅛" wide and from ⅛ to ⅜" thick were ground to give a .0001" tolerance on 4 sides over all. There was only 1 reject in 2500 pieces.

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Here's a direct drive Surface-Grinder with 1140 square inches of hand scraped bearings and mechanism safely sealed inside. A magnetic chuck holds work firmly without clamps. Vibration is practically nil because the DO-ALL is sturdily built—weighs more than a ton. Adaptable to wet or dry grinding. Comes in two models.

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Send for data about the two DO-ALL models.



A Boring Cutter ground on the DO-ALL. Two cutting edges ground to .001. Clearance and step-down ground to .002. Keyway ground from side to side to .0001.



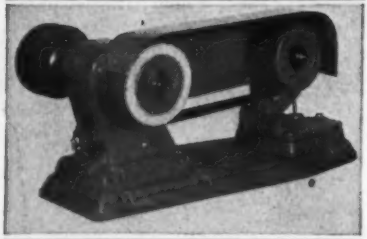
Fixture used to hold the Boring Cutter to 45° angle, tolerance held to .001.

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JONES ENGINEERING COMPANY
DEPT. B-3
ELLWOOD CITY, PENNSYLVANIA

the furnace of a type in which the heat can be localized on the end of the tool. Also, a pre-heating furnace is useful; but if not available the required preheat may be applied in the cooler portions of the high heat furnaces.

MATERIAL: For brazing with copper: Copper shims .003/.005 inches in thickness. Brazing flux suitable for brazing with copper. A good grease solvent.

Procedure for brazing with copper:

1. Machine or grind a recess in the shank to match the tip. Make sure that the surface of the tip which is to be brazed is fairly smooth. A milled or ground surface is satisfactory.
2. Remove all grease and dirt with the solvent.
3. Coat the tip and the recessed end of the shank with copper type brazing flux.
4. Place the shank in the furnace, and heat until the flux flows freely. Maintain a neutral or slightly reducing atmosphere.
5. Remove the shank and fit the copper shim into the recess.
6. Fit the tip onto the shim.
7. Preheat the assembled tool to about 1600° F. in the preheating furnace or in the cooler portion of the high heat furnace.
8. Transfer the tool to the high temperature furnace and hold it at the proper quenching temperature for the grade of high speed (2200° to 2350°), until the tip has soaked out. Soaking time should be kept to a minimum to prevent grain growth.
9. Since the melting point of copper is 1980° F., the copper shim will have melted and spread over the interfaces. Withdraw the tool.
10. Adjust the alignment.
11. Press the tip firmly into place to squeeze out the excess copper and flux.
12. As soon as the copper has solidified, quench the tipped end in oil until the temperature has dropped to below 200° F.
13. Temper the tool at 1000°/1050° F.

Material for brazing with ferro-alloy cement: Ferro-alloy cement, copper sulphate, sulphuric acid.

Procedure with ferro-alloy cement:

1. Prepare a flat surfaced recess for the tip. The surfaces to be joined should be fairly smooth. Milled finish or equivalent is satisfactory.
2. Clean surfaces with the grease solvent.
3. Prepare a solution of 3 ounces of copper sulphate and 10 drops of concentrated sulphuric acid, dissolved in one pint of water. With this solution paint the surfaces to be joined.
4. While the surfaces of the recess are still moist sprinkle over them a layer of commercial ferro-alloy cement. Smooth out the layer so that it is flat and about 1/32 of an inch thick.
5. Press the tip firmly into the recess.
6. Set the tool aside for an hour or more. This will affix the tip securely enough to permit handling.
7. Preheat the tool to about 1600° F., in the preheating furnace or in the cooler portion of the high heat furnace.

MAINTENANCE POINTERS FROM AIR O'TOOL



LOOK WHAT IT FEEDS HITLER

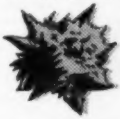
THE AIR STRAINER
—How it Works



The Air Strainer in the handle of your Rotor Air Tool has a screen which keeps all foreign matter and pipe scale out of the working parts of the tool. This screen should be examined weekly and, if dirty, should be blown out or washed out. If damaged, it should be replaced with a new one—available at nominal cost. The strainer is easily disassembled. See above sketch.

THE Strainer in the handle of your AIR tool may be a little gadget in size but it's mighty important in deed when it comes to speeding the day of doom for Hitler & Co.

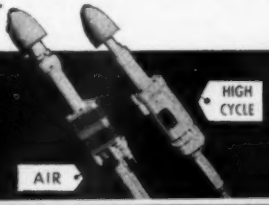
Look what it keeps out of the tool. Look at a grain of dirt under a microscope. Those sharp edges eat away critical tool life and cut down vital production.



Grain of dust through a microscope.

Take good care of that little strainer and the other elements in your AIR system that keep your tools clean and powerful. Help make the Axis bite the dust!

A full discussion of AIR supply and 10 other subjects are given in the Rotor Maintenance manual, "Keep 'em Running". You should have this guide—also the handy wall chart which gives the salient points. A similar set of aids is available on HIGH-CYCLE tools. Yours for the asking . . . and the using.



ROTOR TOOL CO.
CLEVELAND, OHIO

8. Transfer the tool to the high temperature furnace and raise it to the quenching temperature proper for the grade of high speed involved (2200° to 2350° F.).

9. Soak out the tip, but keep the soaking time to a minimum.

10. Withdraw the tool and press the tip into the recess to squeeze out excess cement, using foot treadle, or tongs.

11. Check the alignment.

12. When the cement has solidified quench the tool in oil or air until the temperature has dropped to below 200° F.

13. Temper the tool at 1000°/1050° F.

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WELDING

RESISTANCE FLASH WELD

This method is particularly adapted to butt welding a high-speed tip to a simple steel shank, but may also be used for welding a tip to the face of a simple steel shank adjacent to the end, although considerable care is required in this procedure.

It is desirable, for butt welds, that the areas of the sections of the two parts to be welded be as nearly equal as possible in order to avoid disproportionate rates of heating. A difference of 10 per cent is the maximum that should exist in applications of this method.

Apparatus: A tempering furnace. A standard resistance flash welder, manually operated or motor or hydraulically driven, and equipped with changeable copper dies machined to fit the contours of the sections to be gripped during welding.

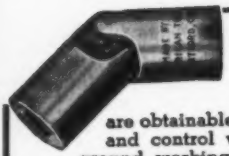
Procedure for welding hardened high-speed steel.

1. Preheat the parts to be welded to about 1000° F.
2. Clamp the tip or stub in one pair of welding dies, and the shank in the other pair.
3. Make sure the alignment is correct.
4. Weld. The duration of the flash, the pressure, and the amount of upset required for an efficient resistance flash weld are details which can be learned only through experience. Assistance may be obtained from the manufacturer of the welder.
5. Immediately at the conclusion of the weld, place the tool in the furnace at a temperature of 1000°/1050° F. and maintain this temperature for about 2 hours. This will relieve thermal stresses at the welded section. The tool should not be permitted to cool in air from the welding heat.
6. At the end of the tempering period, remove the tool from the furnace and cool in air.
7. Remove and flash and dress the upset.
8. Form the cutting edge.

Procedure for welding annealed high-speed blanks to simple steel shanks, not for subsequent forging:

1-4 as above.

5. At the conclusion of the weld, bury the tool in lime, mica, ashes, or other inert material until cool, to prevent excessive thermal shock.



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VANDERBEEK Universal Joints

are obtainable in two sizes—the "Baby Giant" for instrument and control work; and the "Giant", with hardened and ground working surfaces for heavy duty work.

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We are indeed proud of this, the highest honor which can be paid to civilians for their contribution to Victory. The "E" pins, which we wear, will serve as an inspiration to even greater achievements in the days ahead.

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Ray H. Rice
General Manager

Quality
TOOL & DIE CO.
Manufacturers of "Quality Products"
INDIANAPOLIS, INDIANA



6. Anneal the tool according to high-speed steel practice.
7. Remove the flash and dress the upset.
8. Form the cutting edges.
9. Harden and temper according to high speed practices.

Procedure for welding annealed high-speed blanks to simple steel shanks for subsequent forging:

1-4 as above.
5. From the welding temperature, cool the tool in lime, ashes, or other inert material.
6. Anneal the tool according to high-speed steel practice.
7. Forge. Then cool in lime, ashes, etc.
8. Anneal according to high speed practice.
9. Form the cutting edges.
10. Harden and temper according high speed practices.

MECHANICAL TOOL HOLDERS

Tool holders are well adapted to the requirements of high-speed steel. They are designed to hold cutters for lathe and planer tools, and consist of a simple steel shank with a recess through one end, into which a cutter is inserted. The cutter is held in place by a set screw. Thus, a relatively small inserted cutter replaces the high-speed steel content of a solid tool.

Altho tool holders are made in a number of shapes for various operations, and in a wide size range, they are particularly useful from a conservation standpoint in sizes below about 1/2 inch. This is because the various brazing and welding methods of tipping are not economically suitable to sizes under 1/2 inch.

Further details, including sizes, types, and applications of tool holders may be obtained from manufacturers.

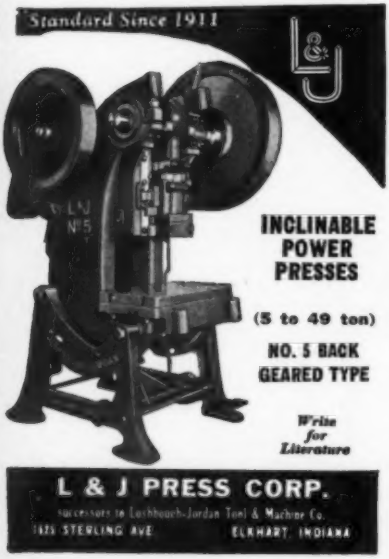
PRESSURE WELD

This method is suitable for jointing high-speed stubs to simple steel shanks. The minimum size that can be welded economically is about 1/2 inch.

Apparatus: Manual, mechanical, or hydraulic pressure machine that can apply 4,000-4,500 lb. per sq. in. of pressure. Pressure gauge capable of measuring twice this pressure. Alignment holding jigs. Heating apparatus, variable with size and shape of cross section to be welded, providing for oscillation of flame through a short distance above and below weld section. Auxiliary furnace capable of attaining temperature of about 1650° F. for slow-cooling welded piece.

PROCEDURE:

1. Smooth cut sections to be welded. A smooth machine finish or equivalent is satisfactory. The cut must be perpendicular to the length of the pieces.
2. Secure the high speed stub and simple steel shank end to end in the welding apparatus.
3. Apply an initial end pressure of about 1,000 pounds per square inch of joint cross section.
4. Ignite the gas in the heating head. Adjust the flame to a neutral or slightly reducing ration.
5. Oscillate the heating head across the weld interface through a distance of about one-third the weld face diameter in either direction from the weld face, allowing a slightly longer play of flame on the high speed side. The pressure will now rise rapidly, due to thermal expansion of the heated sections. Then as the metal in this weld zone becomes heated into the plastic range the pressure gradually falls off. This will be at a temperature of 2300° to 2500° F.
6. When the welding pressure has dropped to a predetermined value of between 3,000 and 4,000 pounds per square inch, maintain this pressure, either manually or automatically. Upsetting will now take place.
7. When a predetermined optimum weld upset has been reached, release the pressure, and remove the piece.
8. Immediately transfer the piece to the annealing furnace at about 1650° F.
9. Cool the piece to room temperature at the rate of 100° F. an hour or slower. If this cooling cycle is followed, a hardness of 325 B.H.N. or less will result.
10. Remove the excess weld metal.
11. Machine the cutting edges.
12. Treat the tool according to standard high speed practice for the grade.



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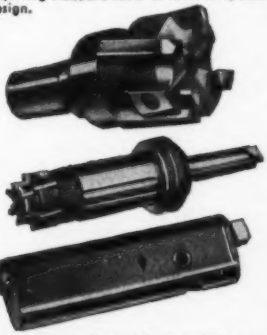
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REAMERS and BORING BARS

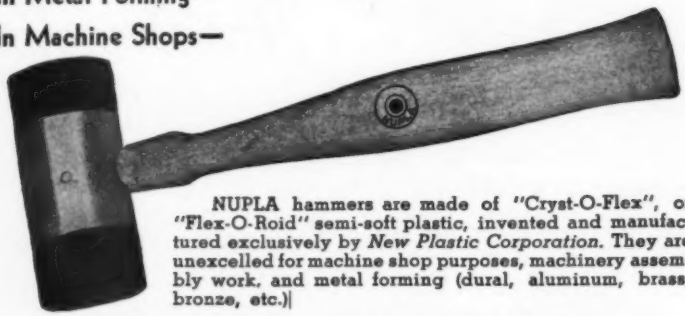
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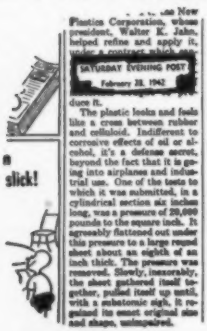
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1-7/8"	24 oz.
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1-3/8"	8 oz.
1-3/8"	17 oz.
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1 "	8 oz.

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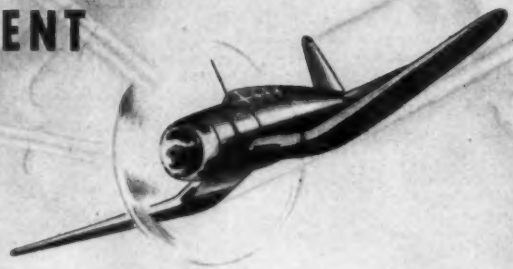
UPPER RIGHT. Broaching the diagonal slot in this brass fuse part is typical of the production-with-precision work required. Using an American 16" Rotary Machine, with 8-station fixture designed for manual loading, automatic clamping and automatic discharge, extremely high output is obtained.

LOWER LEFT. American broaching engineers designed this fixture to locate and index the part from three holes, with further support by recessing part in toughened steel block to minimize burr. American's *complete* broaching service—machines, tools, and engineering — contributes mightily to winning war production, profitable post-war production.

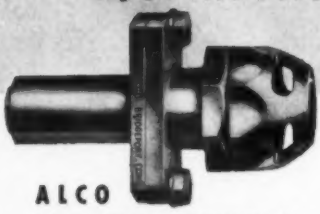
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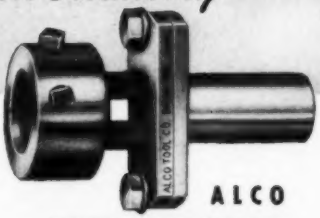


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Standardize now on ALCO Die Holders, either Button or Acorn Type, for guaranteed accuracy of all outside threading operations. The floating operation of the flanges on both types results in absolute concentricity when setting up, and maintains perfect threading on exact centers throughout the run. Quick and easy set-up for high speed production.

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ALCO EFFICIENT TOOLS

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Die set pullers

GONE FOREVER—battered and damaged die sets caused by prying or hammering. **ACRO DIE SET PULLERS** do the job the **FIRST** time. No Delay. Use **ACRO PULLERS** for safe sure separation. They are fast—accurate—positive. War plants using these pullers report savings as high as 50% in time alone.

ACRO PULLERS are indispensable for the grinding, mounting and fitting of punches, enabling the operator to raise punch from die easily, quickly and smoothly, positively holding the set at any desired height.

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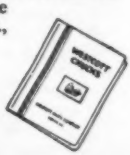
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A justified complaint is pretty much of a rare experience for Westcott. There's no letdown in our precision manufacturing or inspection. But wartime conditions limit availability of certain special steels. Once in a while, a Westcott, subjected to extra hard usage, may not stand up to peacetime standards. We are doing our best . . . and we're all in the same boat! Westcott Chuck Co., 1601 East Walnut St., Oneida, N.Y.—*since 1872.*

Write for Westcott Catalog No. 550.



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The Foremanship Forum

Part XII.—Intelligent Selfishness

By EDMUND MOTTERSHEAD

This Exclusive Story is based on a personal interview granted by Mr. Lincoln. The opinions expressed are those of Mr. Lincoln and the author. The Editor.

IT has taken a second great world conflict to bring most of us to realization that the true purpose of industry is production, not profits. The goal of any manufacturing organization should be to make a consistently better product at lower cost, to be sold at an ever-lessening price. Profit is a by-product of efficient production which serves a need.

Marx saw one great reality: that labor—work—sweat—skill—are the only sources of wealth. His antagonism to capital arose because, in his eyes, capital took an unjustified share of the wealth created by work. Basically, he got that idea because the entrepeneur of the day had profit as his goal, not production.

The rise of labor unions and labor difficulty is directly traceable to natural human reaction against a type of industrial management which had profit as a goal. Workers saw sweatshop practices; they saw their jobs lost thru new methods, new machines; they saw prices kept high and wages kept low. It is not my purpose here to justify, or condemn labor unionism, or to condemn the management which created conditions that brought about much of the trouble. My purpose is to explain an underlying principle, and in some measure to point out a philosophy and a method of industrial organization which can increase production and profits to the satisfaction of all concerned:—labor, management, and consumer.

Let's get down to first principles. We have only a few basic factors to consider:

1. Natural selfishness in men.
2. Sources of wealth.
3. Nature and use of money.
4. Division of wealth.

Natural selfishness of men.

The instinct of self preservation, love of home and family, call it what you wish, is basic to our every effort. We work—or connive—or scheme—or plan in order to live. Possibly the first principle in



James F. Lincoln, President, The Lincoln Electric Co., Cleveland, Ohio.

economics is that man's physical wants and desires are limitless; that there is an unlimited market for goods and services, provided sufficient purchasing power exists to support desire and turn it into demand.

The selfishness of one individual or a group of individuals in society has so often led men to acquire for themselves more of the world's goods than are possessed by other men, that it scarce needs expansion. The farm bloc wants one thing; labor wants another; the silver senators hold out for the special interests of their constituents; management seeks to hold back profits for the stockholders; stock speculators resist regulation so that they may profit in their dealings; politicians insist on soaking the rich so that there will be more public money with which to sway the votes of the poor, and so on.

However, each selfish person, each selfish group, is not only blind to its own iniquity, but is outraged and put upon by the selfishness of the other parties. Labor is incensed at the selfishness of management. Management is affronted by the selfishness of labor and politicians. The politicians are disturbed by the selfishness of everyone because they want to help everyone. Few use restraint in the matter.

What is required, first, is understanding that you can't fight selfishness. You can **work with** the other fellow's selfishness, but you can't change it by bucking his basic desires. The satisfaction of your own selfish desires, then, requires that you apply intelligence to the problem, and find a way to satisfy the other fellow's selfish desires which also satisfies yours.

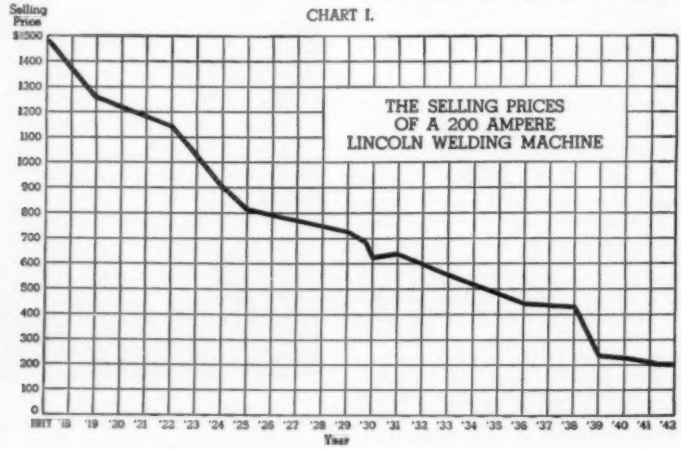
Sources of wealth

Basically, the source of all wealth is labor, whether that labor be the efforts of workingmen, engineers, or efficiency experts. However, chronologically, it is not so simple as that. The first step in creation of wealth is work,—direct production for consumption. The second step is the saving of a portion of that wealth. The third step is the conversion of that saved portion into tools, machines, buildings, and devices which increase the productivity of labor.

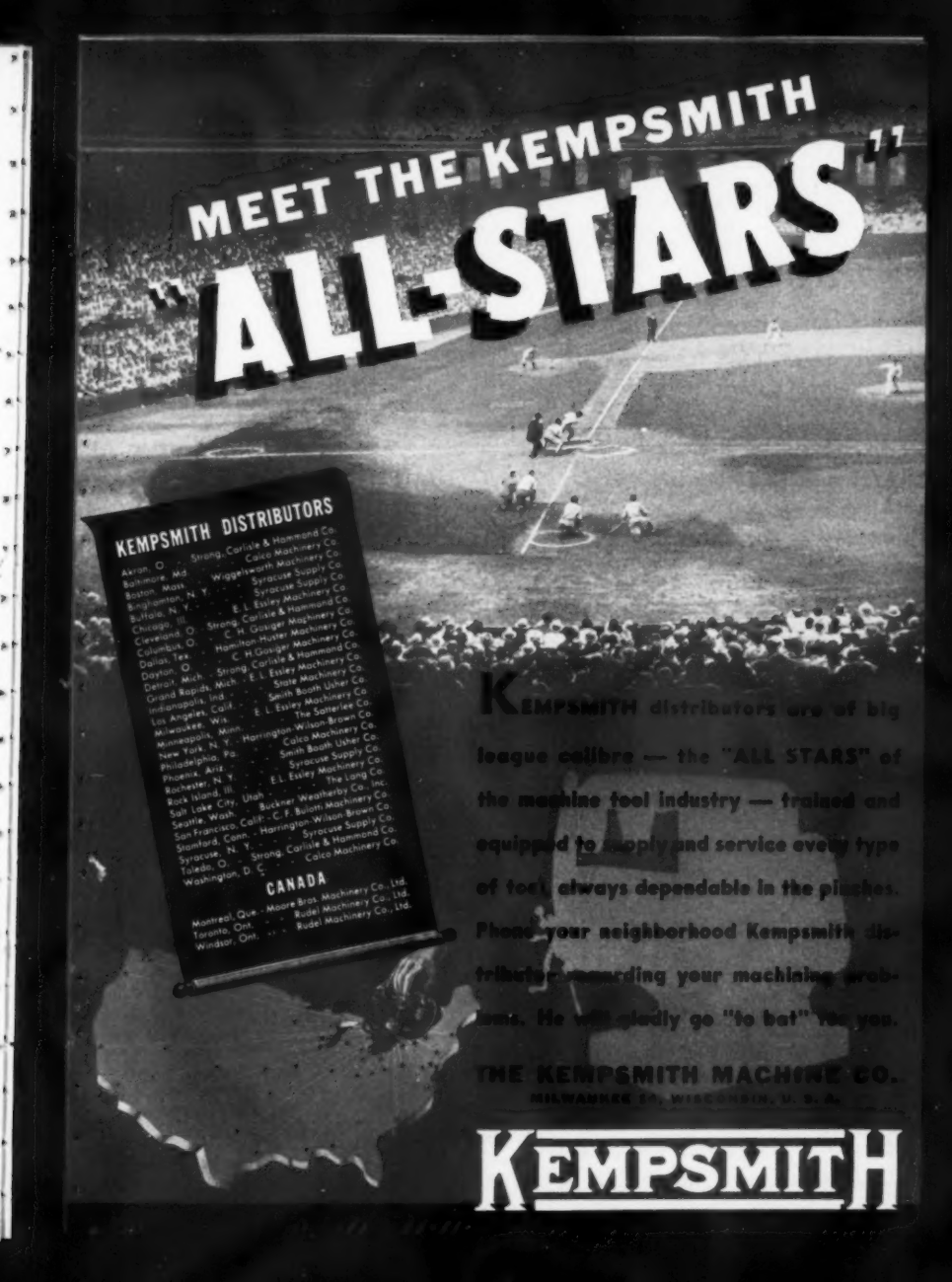
Having once started the cycle and gone thru the three steps, it more or less repeats itself with minor variations in an increasing spiral, as technology advances and more and more machines come to be used.

However, at about this time we find most men working for relatively few

CHART I.



MEET THE KEMPSMITH "ALL-STARS"



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Detroit, Mich.	E. L. Essley Machinery Co.
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New York, N. Y.	Calco Machinery Co.
Philadelphia, Pa.	Smith Booth Usher Co.
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Rochester, N. Y.	E. L. Essley Machinery Co.
Rock Island, Ill.	The Long Co.
Salt Lake City, Utah	Buckner Weatherby Co., Inc.
Seattle, Wash.	C. F. Buloth Machinery Co.
San Francisco, Calif.	Harrington-Wilson-Brown Co.
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Syracuse, N. Y.	Strong, Carlisle & Hammond Co.
Toledo, O.	Calco Machinery Co.
Washington, D. C.	

CANADA

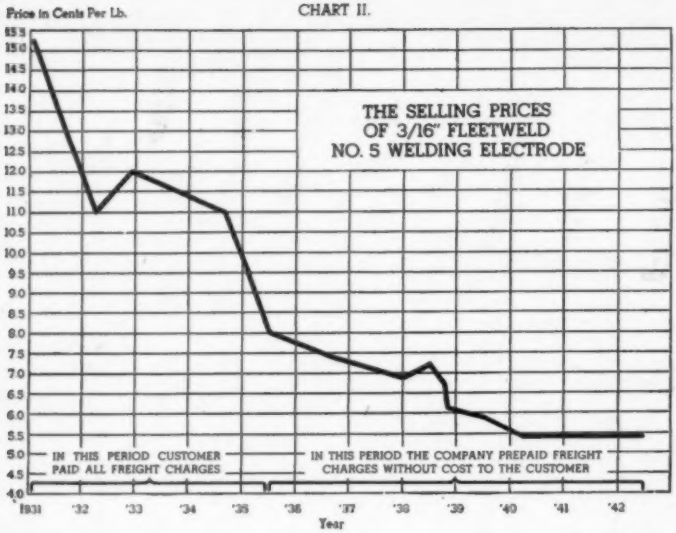
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KEMPSMITH distributors are of big league calibre — the "ALL STARS" of the machine tool industry — trained and equipped to supply and service every type of tool, always dependable in the pinches. Phone your neighborhood Kempsmith distributor regarding your machining problems. He will gladly go "to bat" for you.

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KEMPSMITH

CHART II.



other men, and two major difficulties arise. The wealth or goods produced hardly can be exchanged directly for other goods and services in our complicated economy. So we have money as a medium of exchange. Money is not the perfect medium. Therein lies one source of difficulty. The other is the problem of satisfactorily dividing the wealth.

Nature and use of money.

We say glibly that money is a medium of exchange and a store of value. It also is a means of economic and social control, political leverage, and by large, the bane of many existences.

As a medium of exchange, money is simply that which all parties concerned receive as representing their share in the wealth produced. It may then be exchanged by them for goods or services produced by other people. It represents simply the amount of amusement, shelter, clothing, food, medical attention, and temporary security obtainable at prevailing prices.

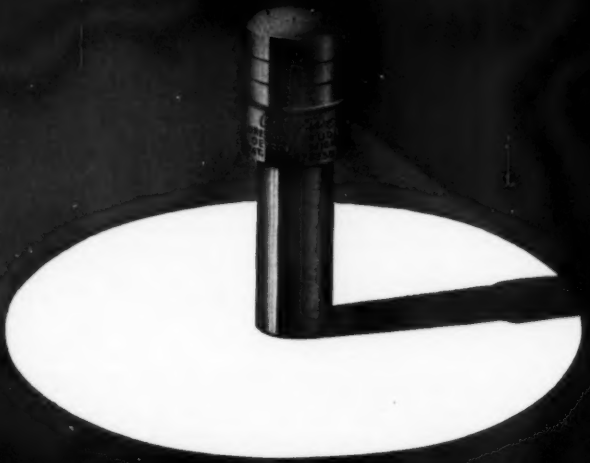
As a store of value, money itself, being tangible, may be saved for future exchange for satisfactions. Hence, that portion of wealth saved and converted into tools and machines is usually represented by money saved and invested in business —capital.

However, as a store of value, money has one weakness:—its exchange value differs as the amount of goods it will buy differs. We are accustomed to think in terms of price. Higher prices mean that money becomes less valuable. But why higher prices? Because a nation or a group collectively has more money with which to buy existing goods and services. If everybody had a thousand dollars, theoretically everybody could purchase 1/130,000,000th of the country. If everybody had five thousand dollars, each could still buy only 1/130,000,000th of the wealth. If the same real wealth existed in both cases, each would receive the same amount of goods and services in either situation.

Hence, the only way to increase the real income of people, the only way to increase wealth is to increase production.

WHEN GRINDERS STOP

Waste Begins



REDRESS WITH

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Third Generation of Diamond Experience

ABRASIVE DRESSING TOOL COMPANY DETROIT

The goal cannot be profit, because profit is measured in money. The effective goal of all effort must be production,—must be increased productivity, with profit as a natural and satisfactory by-product, which leads us to the next problem. How increase productivity? The answer to that lies in the division of the wealth produced.

Division of wealth.

Let us make one thing clear:—division of wealth is not a moral question. There is no relevance to such considerations as equity, fairness, justice, and similar values. The principles of ownership of property, the rights of man, the philosophies and religions of men have no place in the thing. There is only one element to consider:—**satisfaction.**

When the wealth produced by an industrial organization is so divided that each worker, each supervisor, each member of management, each stockholder is **satisfied**, production will increase to the limit of each individual's ability to contribute to that increase.

The simple principle underlying such a division of wealth produced is that, by permitting the other fellow to have more —i.e., to have greater satisfaction, you will receive greater satisfaction yourself, because he will produce more, and there will be more to divide.

The division of wealth, then, in terms of money, as wages, profits, dividends, bonuses, etc., is the answer to the problem of productivity. Natural human selfishness cannot be ground down and stamped out. It must be worked **with**, not against. If every reasonable means is taken to give the worker a greater share in the wealth he helps to create, his interest will be increasingly directed towards creating more, towards working more efficiently.

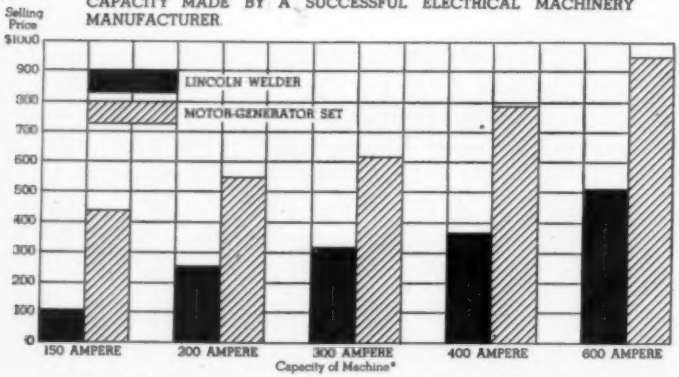
By this time you are probably saying:—"That's a very pretty outline of common sense economics. So what? Does it apply to the situation in my organization, and if so, how?"

It does, and I'll tell you how:

Right now your organization is faced with a manpower shortage—at least that's what you call it. But it is not so much a shortage of manpower, of manhours worked, as it is a shortage of **productivity from manpower.**

CHART III.

SELLING PRICES OF LINCOLN WELDERS COMPARED WITH THE SELLING PRICES OF STANDARD MOTOR-GENERATOR SETS OF EQUAL CAPACITY MADE BY A SUCCESSFUL ELECTRICAL MACHINERY MANUFACTURER.

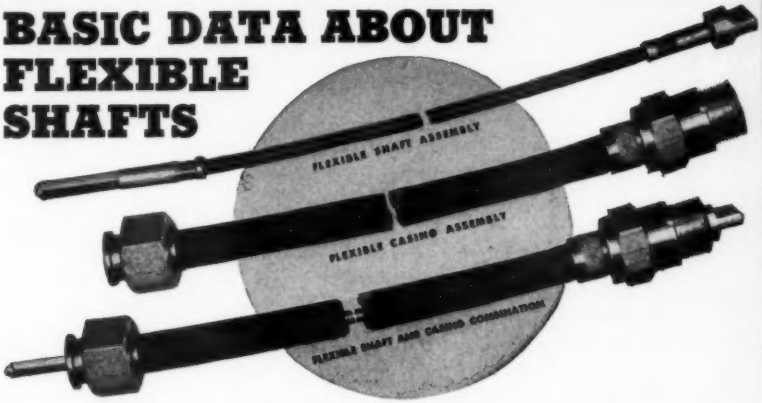


*Ratings are welder ampere ratings. Motor generator sets have equivalent current output at similar voltage.

Welders have special controls which are not ordinarily used on motor generator sets. To obtain accurate comparisons of similar equipment the proportional cost of the controls has been removed from the selling price of the welder.

Source: A Certified Public Accountant in the City of Cleveland.

BASIC DATA ABOUT FLEXIBLE SHAFTS



A FLEXIBLE SHAFT UNIT — consists of three elements — (1) a flexible shaft — (2) a flexible casing — (3) end fittings for the shaft and the casing.

FLEXIBLE SHAFTS FOR POWER DRIVES. Engineered and built expressly for transmitting power, they come in diameters from .043" to .750" with a selection of flexibility and strength characteristics in each size.

BULLETIN 1238 gives details of S. S. WHITE Power Drive Shafts.

FLEXIBLE SHAFTS FOR REMOTE CONTROL. Engineered and built for smooth, sensitive remote control, these shafts come in diameters from .095" to .437", also with a selection of characteristics in each size.

BULLETIN 38-42 gives details of S. S. WHITE Remote Control Shafts.

FLEXIBLE CASINGS FOR SHAFTS. In practically all shaft applications, a casing is required to provide bearings and protection for the shaft and to retain lubricant. S. S. White Casings come in the following types — Standard and Heavy Duty Fabric Covered —Synthetic Rubber Covered — Heavy Duty Rubber Covered. Casing data are included in the bulletins mentioned above.

END FITTINGS FOR SHAFT AND CASINGS. These are the means by which shafts and casings are connected to driving and driven or controlled members. S. S. White offers a wide selection of designs.

BULLETIN 43 covers end fittings.

COPIES OF THE BULLETINS — will be mailed to anyone interested on request. Consult S. S. White on anything pertaining to flexible shafts.*



**The need for our shafts in war equipment confines our production and service to war work until Victory is won.*

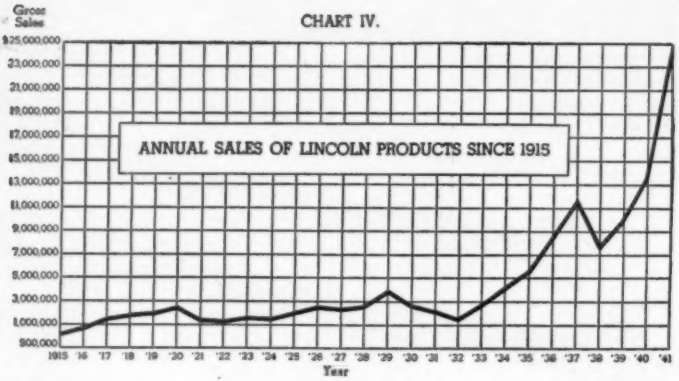
S. S. WHITE

The S. S. White Dental Mfg. Co.

INDUSTRIAL DIVISION

Dept. H, 10 East 40th Street, New York 16, N. Y.

CHART IV.



Your real problem is not where to find more men, but how to make the men you have more productive.

Psychologists estimate that the average worker is only using from 15 to 50 % of his total ability. If the effectiveness of the workers in American industry could be increased only 10 per cent thru increasing their **will to produce**, it would be the effective equivalent of an additional 5,000,000 workers!

How are you going to increase the productivity of your workers? By giving them a **reason** to produce more. What reason? The chance to profit more by their own effort—not just a little more, not just the surface-scratching prodding of the haphazard incentive; but by adopting and using the basic philosophy of intelligent selfishness in your whole labor relations program.

Not as just another organization's "incentive plan", but as a working example of this principle, take the experience of the Lincoln Electric Co. Lincoln is by no means the largest industrial organization in the world, nor the smallest. It is, in size and organizational problems perhaps typical of industrial plants employing from several hundred to two or three thousand men in an operational unit.

As was the case with other organizations, the company was started by one man with little or no capital—(in 1896 with $150.00 to be exact.) From that point on, the similarity ceases.

The company has continuously followed the principle of appealing to the intelligent selfishness of the worker, the manager, and the investor. It has gone along this relatively unique road long enough so that the results of applying this policy can be proved statistically.

The results are, in the words of James



DIAMOND ACME TOOLS

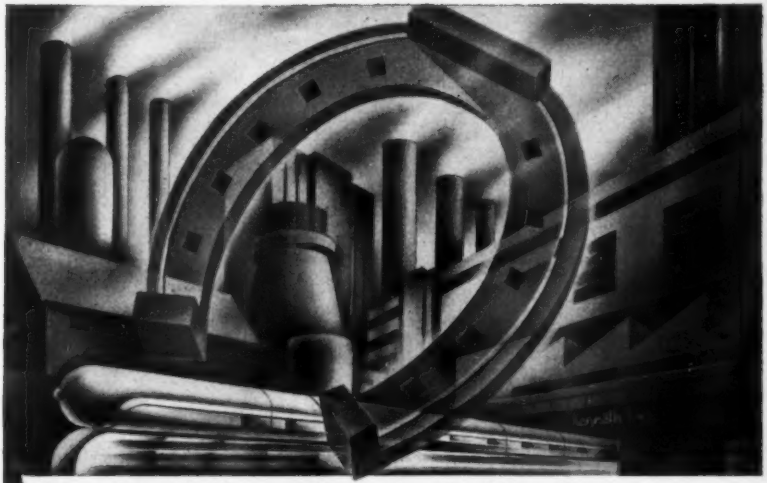
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If you don't know diamonds know your diamond dealer. Our 45 years in this field merits your confidence.



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You Don't Know How Lucky You Are

... Lucky that medical directors, industrial nurses, and safety engineers are doing the fine job they are in keeping limited manpower effectively at work . . . Lucky that these far-sighted executives developed tools and techniques to carry on their vital task.

One such technique is a "Planned Procedure" featuring a new product expressly designed to combat industrial dermatitis . . . skin irritation that industry is finding costly in time, money, and man-power. Its name is TARBONIS CREAM.

An industrial physician and a progressive safety engineer in an Ohio Ordnance plant, troubled with an average of 30 to 40 new cases of dermatitis every week due to cutting oils and chemical irritants, developed a plan using TARBONIS CREAM. Today, after six months, not one case of occupational dermatitis has developed in that plant.

This "Planned Procedure" is now available. If your plant has a problem of lost efficiency and absenteeism due to dermatitis, write for information.

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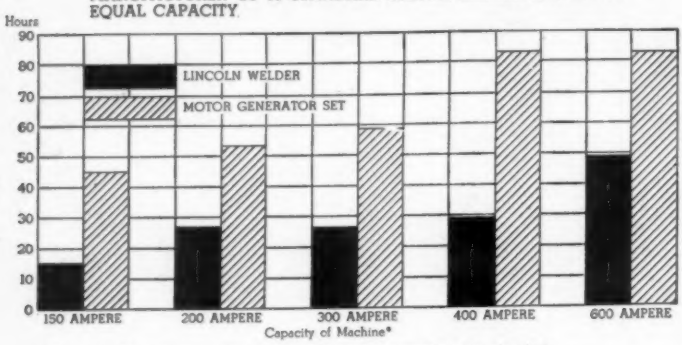
Tarbonis

cream

FOR INDUSTRIAL SKIN IRRITATIONS

CHART V.

HOURS OF DIRECT LABOR ON VARIOUS TYPES OF WELDING MACHINES COMPARED WITH THE HOURS OF A SUCCESSFUL MANUFACTURER OF A STANDARD MOTOR GENERATOR SET OF EQUAL CAPACITY



*Ratings are welder ampere ratings. Motor generator sets have equivalent current output at similar voltage.

Welders have special controls which are not ordinarily used on motor generator sets. To obtain accurate comparisons of similar equipment the hours of labor in manufacturing these controls are not included.

Source: A Certified Public Accountant in the City of Cleveland.

F. Lincoln, and as the accompanying audited charts show:

1—Lincoln factory workers are the highest paid employees in industry anywhere in the world.

2.—Lincoln workers produce more per hour than any organization making a comparable product anywhere in the world.

3—Lincoln selling prices are substantially lower.

4—Lincoln stockholders have never missed a dividend since the first payment was made in 1918, and dividends have increased. The 1938 dip, shown in Chart VIII is due to variation in extra dividends, not to decline in regular dividends.

5—The company claims that it does approximately half of the total arc welding equipment business in the United States, and before the war, more than 25% of all the arc welding business in the world.

6—Practically speaking, there is no labor turnover. Of 293 employees (total 1932), 208 in 1942 received service pins for 10 or more years of service with the company.

7—There is no labor union.

8—Selling prices of Lincoln products have been reduced over a period of 20

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These files are available in a number of different styles and sizes, in either High Carbon Steel or High Speed Steel.

Send for catalog showing a wide variety of standard shapes and special shapes. Perhaps we have what you want in stock, if not, we can grind it.

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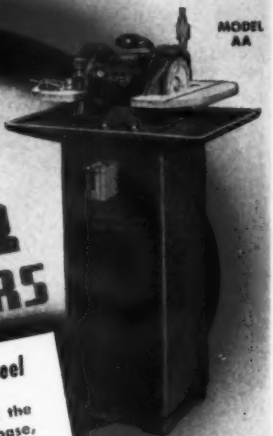
If you have need for special shape Files, we shall be glad to submit the desired File for your approval and trial upon receipt of a sample or sketch.

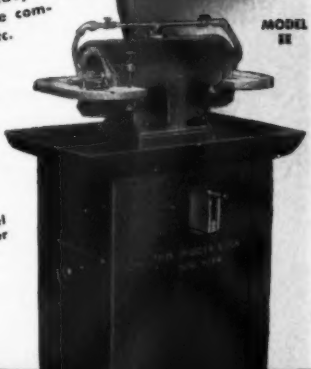
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NEW Improved PROSSER CARBIDE GRINDERS

for Carbide • Stellite • High Speed Steel





• New Model AA Floor Type Machine has all the features of our famous grinders, with heavy base, drum type on-off-reverse switch, storage compartment for wheels, heavier tables, etc.

New Model EE Machine embodies many new features, including improved wet-grinding equipment, heavier base, etc.

FEATURES OF PROSSER GRINDERS

- Quick-acting indexing tables.
- Adequate wet-grinding equipment.
- High grade ball bearing spindles.
- Oversize wheels, giving longer wheel life, and permitting grinding of larger tools.
- Moderate price.

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THOMAS PROSSER & SON

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years to approximately one-fifth of what they were. Sales have increased from less than a million dollars to about 30 million dollars annually.

The annual productivity of Lincoln workers is asserted to be approximately twice that of efficiently operated comparable companies, and four times that of other companies.

What was the system that made these accomplishments possible? As an all-around program for appealing to the intelligent selfishness of all concerned, the salient details are:

1.—An advisory board—chosen from the entire personnel of the plant. This is done by electing one man from each department by the vote of all the people in the department. The foremen are represented by a man from their group. These, together with the plant superintendent and the president make up the board. This board has authority over all matters affecting the men and shop operations.

2.—A piece-work plan which has proved satisfactory to all concerned. Each job is time-studied and the rate set, so that normal production, as of the rate set, will pay the worker 20% more than the guaranteed daily wage. The rate is guaranteed by the company forever. The rate can be changed only by challenge from the worker. If challenged in that way, the time study man works the job himself for a week, and either proves the rate or adjusts it. The company can change the price of a job only by changing the method, design, or tooling.

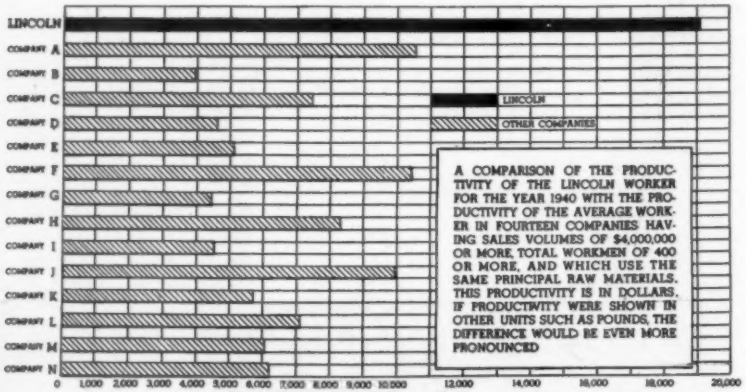
3.—The lives of all workers are insured for the amount of a year's wages at no cost to the workers.

4.—Two weeks' vacation with pay is provided for all workers.

5.—Company stock is sold to employees who desire it, provided they have been continuously employed for a year. More than half of the normal personnel own stock, and approximately 90% of the stock is owned by people working for the company and on its payroll, or by members of their immediate families.

6.—The company suggestion system is similar to others in industry. The worker makes his suggestion. It goes to the engineering department, is checked by time study and shop engineers and the superintendent.The worker is paid as soon as the idea is accepted. He also gets 50% of

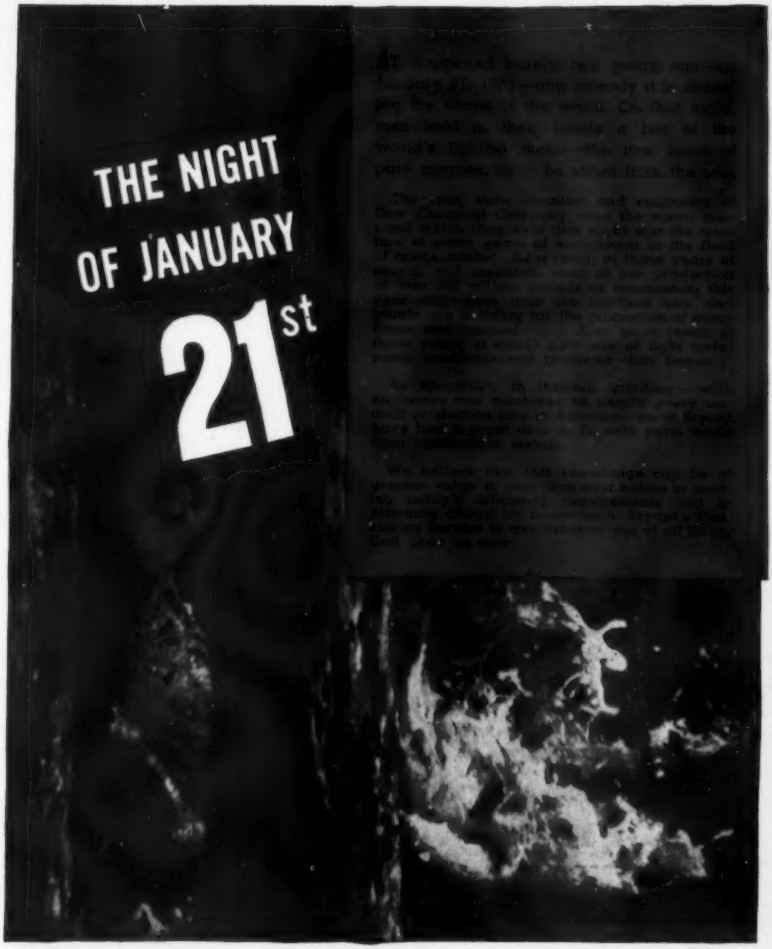
CHART VI.



*Worker productivity equals total sales in dollars divided by average number of employees.

COMPANY A: Machine Tool Mfr.
COMPANY B: Auto and Aircraft Parts Mfr.
COMPANY C: Gas Welding Supplies Mfr.
COMPANY D: Electrical Equipment Mfr.
COMPANY E: Electrical Equipment Mfr.
COMPANY F: Auto Mfr.
COMPANY G: Auto Part Mfr.
COMPANY H: Auto Part Mfr.
COMPANY I: Electrical Equipment Mfr.
COMPANY J: Machine Tool Mfr.
COMPANY K: Domestic Furnace Mfr.
COMPANY L: Auto Mfr.
COMPANY M: Machine Tool Mfr.
COMPANY N: Gas Welding Supplies Mfr.

Source "Moody's Industrials", 1940



Bryant Chucking Grinder Company

SPRINGFIELD, VERMONT, U. S. A.



SEND FOR THE MAN FROM BRYANT!

years to approximately one-fifth of what they were. Sales have increased from less than a million dollars to about 30 million dollars annually.

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1.—An advisory board—chosen from the entire personnel of the plant. This is done by electing one man from each department by the vote of all the people in the department. The foremen are represented by a man from their group. These, together with the plant superintendent and the president make up the board. This board has authority over all matters affecting the men and shop operations.

2.—A piece-work plan which has proved satisfactory to all concerned. Each job is time-studied and the rate set, so that normal production, as of the rate set, will pay the worker 20% more than the guaranteed daily wage. The rate is guaranteed by the company forever. The rate can be changed only by challenge from the worker. If challenged in that way, the time study man works the job himself for a week, and either proves the rate or adjusts it. The company can change the price of a job only by changing the method, design, or tooling.

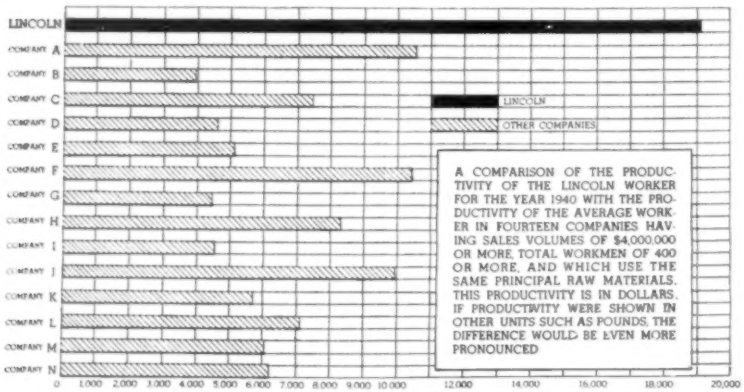
3.—The lives of all workers are insured for the amount of a year's wages at no cost to the workers.

4.—Two weeks' vacation with pay is provided for all workers.

5.—Company stock is sold to employees who desire it, provided they have been continuously employed for a year. More than half of the normal personnel own stock, and approximately 90% of the stock is owned by people working for the company and on its payroll, or by members of their immediate families.

6.—The company suggestion system is similar to others in industry. The worker makes his suggestion. It goes to the engineering department, is checked by time study and shop engineers and the superintendent. The worker is paid as soon as the idea is accepted. He also gets 50% of

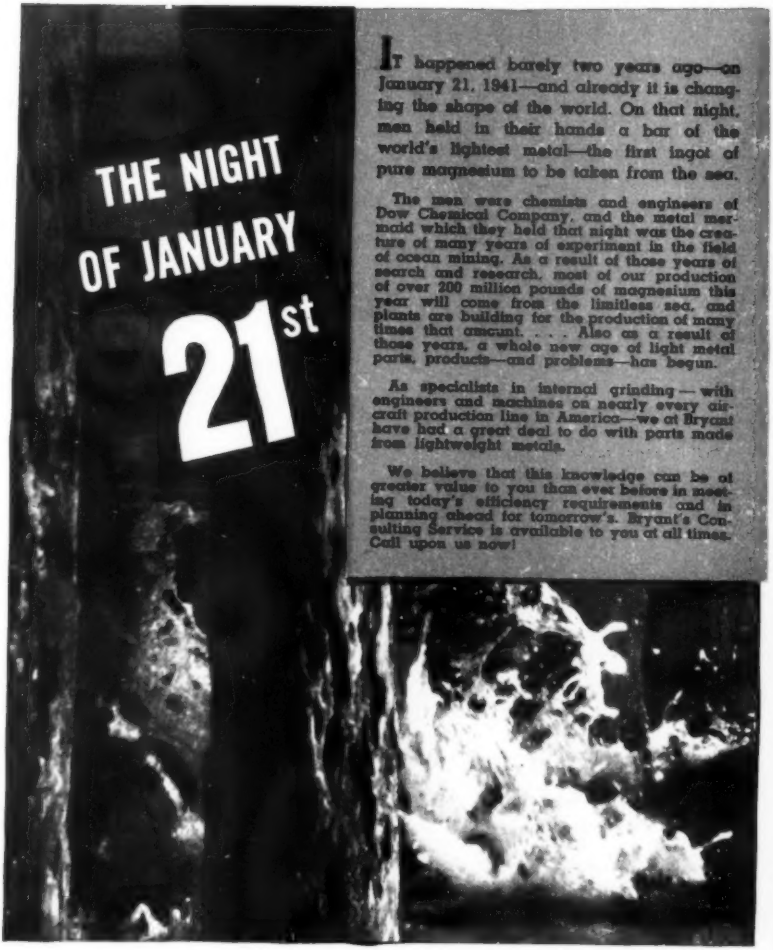
CHART VI.



*Worker productivity equals total sales in dollars divided by average number of employees

COMPANY A.	Machine Tool Mfr.	COMPANY E.	Auto Mfr.	COMPANY I.	Machine Tool Mfr.
COMPANY B.	Auto and Aircraft Parts, Mfr.	COMPANY G.	Auto Part Mfr.	COMPANY K.	Domestic Furnace Mfr.
COMPANY C.	Gas Welding Supplies Mfr.	COMPANY H.	Auto Part Mfr.	COMPANY L.	Auto Mfr.
COMPANY D.	Electrical Equipment Mfr.	COMPANY J.	Electrical Equipment Mfr.	COMPANY M.	Machine Tool Mfr.
COMPANY E.	Electrical Equipment Mfr.			COMPANY N.	Gas Welding Supplies Mfr.

Source "Moody's Industrials", 1940



IT happened barely two years ago—on January 21, 1941—and already it is changing the shape of the world. On that night, men held in their hands a bar of the world's lightest metal—the first ingot of pure magnesium to be taken from the sea.

The men were chemists and engineers of Dow Chemical Company, and the metal mermaid which they held that night was the creature of many years of experiment in the field of ocean mining. As a result of those years of search and research, most of our production of over 200 million pounds of magnesium this year will come from the limitless sea, and plants are building for the production of many times that amount. . . . Also as a result of those years, a whole new age of light metal parts, products—and problems—has begun.

As specialists in internal grinding — with engineers and machines on nearly every aircraft production line in America—we at Bryant have had a great deal to do with parts made from lightweight metals.

We believe that this knowledge can be of greater value to you than ever before in meeting today's efficiency requirements and in planning ahead for tomorrow's. Bryant's Consulting Service is available to you at all times. Call upon us now!

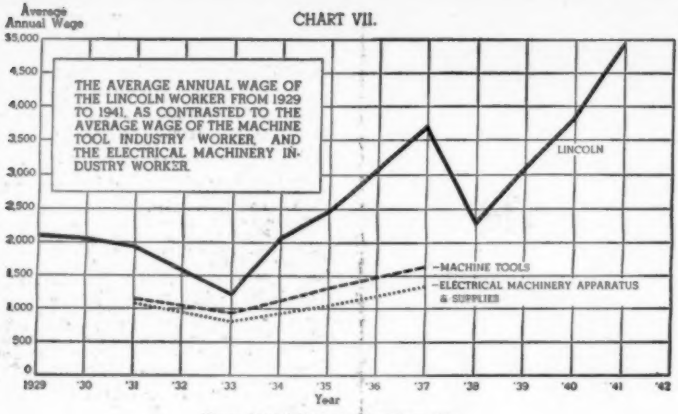
Bryant Chucking Grinder Company

SPRINGFIELD, VERMONT, U. S. A.



SEND FOR THE MAN FROM BRYANT

CHART VII.



*Source: Statistical Abstract of the United States, 1940
U. S. Dept. of Commerce, Bureau of the Census
Industry Figures Available Only for the Years Shown

the estimated first year's saving resulting from the suggestion.

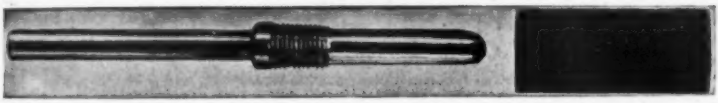
7.—Annual Incentive Pay is given everyone in the plant except the president of the company—the amount of the bonus fund depends upon the success of the business for the year. The bonus is apportioned directly in accordance with the productivity of the worker, his length of service, and his general value in the shop.

8.— There is a retirement annuity plan under which workers may retire voluntarily at the age of 60 or work until 65 and retire. The annuity amounts to 2% of the annual paycheck, multiplied by the years of service for the company. The entire cost of the retirement annuity is paid by the company.

According to Mr. Lincoln:—"Management must be able to lead the organization in the direction of more efficient methods as fast as the methods can be absorbed by the organization. This will be found to be the chief difficulty in many plants.

"Management and men are 'fellow-workers'. Neither is superior, but each is responsible for his part in the result. Of course, management's direction is unquestioned and enthusiastically followed. Consequently, management must be made up of the best managerial ability in the organization. When a man with new

FLEXIBLE ABRASIVE WHEELS



Designed for precision work where flexibility is required, these wheels are useful accessories for sanding and finishing regular and irregular jobs, penetrating into difficult recesses, lapping holes in dies, finishing various shapes of metal, wood, rubber and plastic parts.

Useful for finishing propellers in aircraft construction. Descriptive bulletin and sample wheel will be sent on request. Prompt Deliveries.

FIELD ABRASIVE SPECIALTY MFG. CO. 203 LOWE BLDG., DAYTON, OHIO

Apostle of the *Impossible!*



He's a strange sort of genius compounded of curiosity, skilled hands and a peculiar mental twist . . . He has visions of impossible things.

One day recently, the National Inventors Council in Washington — America's clearing house for war-winning inventions — had a letter from him. It read: "Sirs: I've a couple of ideas in my head that may be of military importance. Kindly send me your bulletin so that I'll know what to do to help. Yours for Victory!"

And today, one of those ideas is helping to win the war — literally "Yours for Victory."

This is a typical story of America's Apostles of the Impossible, the inventors, the builders and the basement-bench Edisons who have submitted to the Council more than 50,000 ideas and inventions in less than 2½ months. All have been carefully examined, hundreds are today being tested, and scores are actually at work winning the war and strengthening America's production lines for the peacetime pull ahead . . . But America needs more!

We at Jones & Lamson have a fair share of "apostles." They are attracted to our kind of work. Through more than a century of our history, these men, with visions of impossible things, have helped to design and develop a formidable list of America's great inventions and many of the basic machine tools in the front line of industry today. We've learned to respect their ideas, from the simplest suggestion to the most complex design — on the assembly line and in the laboratory — and we're urging them to help the government by submitting all promising plans to the National Inventors Council.

We hope that you too are seeking out such men, and helping to mobilize their inventive genius for the protection of the country — and the company — they're working for in this emergency.

For any counsel or assistance that we can give to you or to any individuals in your company on ideas involving the use of precision machine tools, Jones & Lamson engineers and service men are at your call.

Universal Turret Lathes . Fay Automatic Lathes . Automatic Thread Grinders . Optical Comparators . Automatic Opening Die Heads

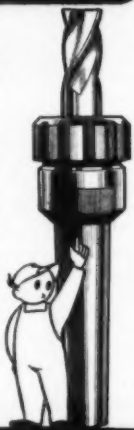
JONES & LAMSON MACHINE CO., SPRINGFIELD, VERMONT, U.S.A.

Profit-producing Machine Tools



"E" TO UNIVERSAL FOR OUTSTANDING ACHIEVEMENT IN THE MANUFACTURE OF VITAL TOOLS

We are proud to announce that we have been awarded the coveted Army-Navy "E" in recognition of the quality and quantity of the Universal precision parts we have been producing for the war effort. You can improve production with Universal Collet Chucks which grip as strong as solid steel in both a radial and axial direction without marring shank. Write for facts.



UNIVERSAL ENGINEERING CO.
FRANKENMUTH • MICHIGAN

managerial ability arises, he is recognized. When one who is a manager slips, he is eliminated. Accomplishing the elimination may give some trouble, both in understanding and in doing in some organizations. Management must be able to stand on its record and be accepted by **all the workers** as being fair, able, and intelligent.

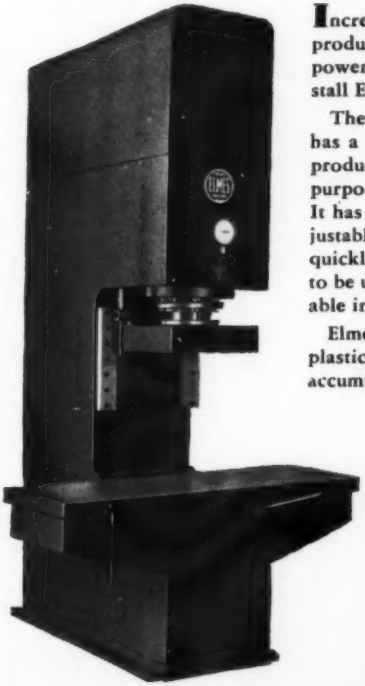
"A factory worker cannot express his ideas so well as a trained man of the world, but he has them just the same. Management must be able to see, select, grade and apply these ideas accurately and fairly.

"The goal of the organization must be this—to make a better and better product, to be sold at a lower and lower price. Profit cannot be the **goal.** Profit must be a **by-product.** That is a state of mind and a philosophy. Actually an organization doing this job as it can be done, will make larger profits which must be properly divided between user, worker, and stockholder. That takes ability and character.

"It must be kept in mind at all times that this is a natural working-out of our inherent selfishness. The only difference between the Lincoln Electric Company and the usual industry is that in this case, the selfishness has been more nearly intelligent. The civil war called 'collective bargaining' is often selfish but not intelligent. The exploiting of workmen is selfish but not intelligent. The practice of raising prices in a seller's market is selfish but not intelligent. The charging of " all-the-traffic-will-bear" is selfish but not intelligent. War is selfish but not intelligent. The only difference between these acts and the program of this company is that these facts are stupidly selfish and the program of this company is intelligently selfish. When we as a nation adopt this principle of intelligent selfishness into our philosophy of life and industry, we will have stopped unemployment of the employable, stopped poverty for the able-bodied, and what is more, we will have gone far toward the elimination of misery, no matter how caused."

As William James, the greatest of American psychologists said in his "Energies of Man":—"The human individual lives usually far within his limits. He

LEARN HOW ELMES HYDRAULICS CAN SPEED YOUR PRODUCTION



Increased output, lowered costs and improved products through smooth, precise application of power, invariably result when manufacturers install Elmes Hydraulic Equipment.

The Elmes general purpose press shown here has a record for such achievement. It is a high production unit with wide application as a general purpose straightening, forming and forcing press. It has controlled speed, a rapid advance and adjustable stroke control—can exert its full force quickly or press gently and slowly. We believe it to be unequalled among presses of its type. Available in many capacities.

Elmes also manufactures metal-working presses, plastics molding presses, extrusion presses, pumps, accumulators, valves and accessories. Ask Elmes engineers to show you how Elmes Hydraulics can speed your production.

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AMERICAN STEEL FOUNDRIES
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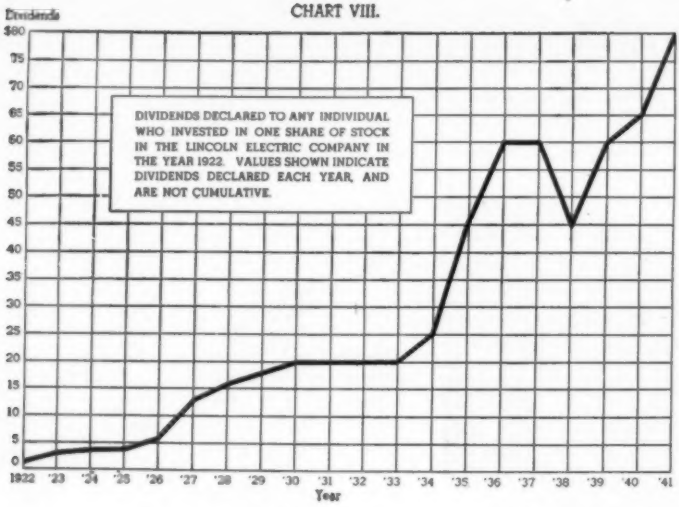
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METAL-WORKING PRESSES • PLASTIC-MOLDING PRESSES • EXTRUSION PRESSES • PUMPS • ACCUMULATORS • VALVES • ACCESSORIES

CHART VIII.

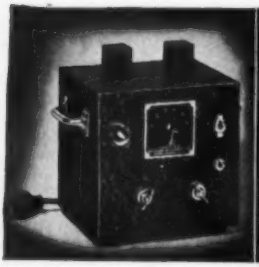


possesses powers of various sorts which he habitually fails to use. He energizes below his maximum, and he behaves below his optimum." There's no limit to what some people will do to evade thought and study.

James further suggests that study of human powers and capabilities, be made, and then of the means to get at these powers, develop and bring them into use. He also states that this cannot be done in any laboratory, but must be done under the exigencies of real life, under conditions such as have existed in the Lincoln Company.

Whether you call it selfishness or personal interest or motivation, such an incentive system as a planned, intelligent application of a fundamental philosophy of industrial organization is essential to the continuance of industrial life and private enterprise.

We have, then, from the experience of this company, in the light of the four basic factors outlined in the beginning of this article, certain conclusions which may be usefully applied to the industrial relations problems of other plants:



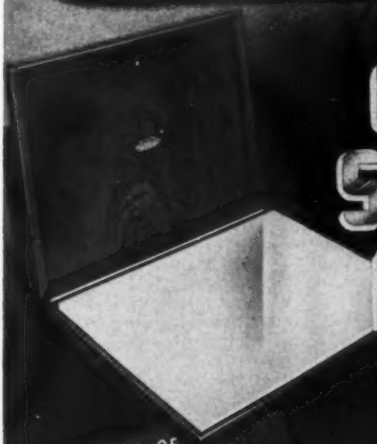
Red "E" DEMAGNETIZERS & ETCHERS FOR SPEED and ECONOMY

A sturdy all around unit for any shop. Demagnetizes by throwing lower switch and passing work over magnetic poles at top of unit. Etching is controlled at upper switch with convenient six station selector to adjust depth of etch. Red indicator light signals when unit is in operation. Rubber extension cord, plug, special alloy etching stylus with self cooling holder are included. Write for folder giving details.

GRINDING MACHINE CO.
10226 WOODWARD AVE. DETROIT, MICH.

The New MARTIN-OMBERG

GLASS SURFACE PLATE



ADVANTAGES OF MARTIN-OMBERG GLASS SURFACE PLATES

1. Accuracy from .0002 to ±.0005
2. Will not rust, corrode, burr or warp
3. Better visibility
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5. Temperature affects accuracy less
6. Surface remains accurate indefinitely
7. Warranted satisfactory

This glass surface plate was developed to fill a vital need for accuracy in the Aircraft industry.

★

It is manufactured out of high grade glass and its surface accuracy is not affected perceptibly by temperature, corrosion or rust. Size 18"x24".

★

Its price of $70.00 is much less than a steel or cast iron plate of comparable quality, and deliveries are prompt.

MARTIN-OMBERG ENGINEERING MANUFACTURING CO., INC.



Production **increased a**

FULL THIRD

***With* BARKER WRENCHLESS CHUCKS AND VISES!**





Pieces-per-hour went up from 18 to 24 when the Lovejoy Flexible Coupling Company replaced an ordinary three-jaw chuck on this P & J Automatic Lathe with a Barker Wrenchless Chuck—and stayed up—because the Barker Chuck is a simple, rugged, self-contained unit, requiring no accessories, auxiliaries or outside source of power. From the moment of installation, it delivers speedy, trouble-free service.

From a trifling investment you obtain continuous generous dividends in time saved, production increased.

Ask for Bulletin 4-A.

THOMAS HOIST CO.

Chuck Division

20 So. Hoyne Ave., Chicago, Ill.

1—That the natural selfishness in men, whether workers, foremen, management, customers, or stockholders, is a force which cannot be eliminated, short of the end of this world as we know it.

2—That this selfishness must be expressed and handled intelligently for the greatest satisfaction of all concerned.

3—That the only real source of wealth, either for the nation or for individuals is thru work—production.

4—That consequently, the force of selfishness must be guided and directed by intelligent management, so that wealth can be increased for all thru a mutual desire for increased effort and more efficient effort.

5—That profits in money cannot be the goal of an industrial enterprise as such. Profit must be a by-product of more efficient operations, producing b e t t e r goods at lower cost, to be sold at reduced prices to more customers; and that this philosophy must be an integral part of the thinking of management and workers alike.

6—That the division of the wealth produced by industry involves no moral issues; rather that it is a problem of finding intelligently that means of division which will bring the greatest satisfaction to all concerned thru the greatest motivation of all concerned to produce for their mutual benefit.

7—That such a program as used by the Lincoln Electric Company, or other companies, is not idealistic or theoretical. Twenty years of experience proves that such a plan works.

8—That due to the habitual mental attitudes of both workers and management in the typical industrial organization, it will take perhaps two to four years to change the basic philosophy of an entire personnel. That changed state of mind will come as they see prices lowered, quality raised, sales and profits increased, and the productivity and income of the workers increased beyond their greatest expectations.

9—That even the phenomenal experience of this company in increasing the productivity of the workers is, in terms of ultimate human p o t e n t i a l s, only scratching the surface of what may be done with intelligent organization and proper motivation.

AMERICAN TOOL SALVAGE CORPORATION

for their products used to build a better "Caterpillar" Machine with which to beat the Axis.

Caterpillar Tractor Co.



Courtesy Caterpillar Tractor Co.

Thanking You . . .



For your continued patronage and to remind you we are here to serve in time of peace as well as war.



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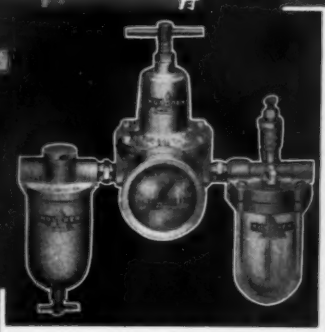


Don't LET YOUR GUNS JAM Now

Every air tool in your plant is a gun on America's production front. Don't let wear and corrosion jam a single gun!

NORGREN (air-line) LUBRICATION checks wear during use—stops destructive corrosion when idle. Use "Norgrens", for MAXIMUM POWER from every air tool; MAXIMUM MAN-HOUR OUTPUT.

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INSTALL DIRECTLY IN AIR LINE

Clean the air; regulate pressures; lubricate every working part of the air tool. Size, type, and combination for every requirement.

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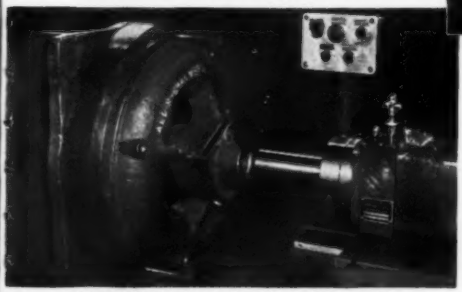
Motor End Shield Bearing Seats Precision Bored on STOKERUNIT SIMPLEX *Precision* BORING MACHINE



Two bearing seats in motor end shield are precision bored in one operation.



The 2U is adaptable to a wide range of work.



End shield is located on face plate type fixture.

Profit with Stokerunit Versatility...

Over 25 versatile models of Stokerunit Simplex Precision Boring Machines are available to solve *your* precision boring problems. They cover practically the entire range of precision boring applications and can be furnished in mechanical and hydraulic feeds, with single or multiple spindles, for either short-run or production work.



For specific recommendations, send blueprints of parts with production requirements. No obligation.

Write Today for these two booklets covering details of our entire line of Simplex Precision Boring Machines.

Finish Boring Time 2 Minutes for Both Seats . . . Total Boring Length—2¾"

The two bearing seats in the end shield of this electric motor are precision bored on a No. 2U Stokerunit Simplex Single-Spindle Precision Boring Machine. Both are identical in diameter—3.6875". Length of bore on first seat is 1½", on the second 1¼". As they are spaced 4⅛" apart, a total spindle travel of more than 6⅞" is necessary to complete the boring operation.

The total boring time of only 2 minutes for both bearing seats is made possible by rapid traverse of the Stokerunit Simplex spindle unit, which automatically provides quick approach to cutting position at each seat and quick return at end of machining cycle.

Additional Boring Data: Spindle speed 400 r.p.m.; feed 1⅜" per min. Tolerance on finish bore is −.001"; high finish is produced. Material is cast iron. Tungsten carbide cutters are used.

The face plate type locating fixture has multiple locating rabbets for holding various sizes of end shields. This fixture is also equipped with an adapter for holding various sizes of ball bearing cages up to 6" in diameter while boring the ball bearing seats.

STOKERUNIT CORPORATION

DESIGNERS AND BUILDERS OF PRECISION BORING MACHINES AND MILLING MACHI





then I said to myself—

Here's How to Reach That Post-war Market Quick

So you want to get the jump on competition — get to that post-war market first with the most sales features? Then take a tip from the Army's amphibious truck—the "duck".

Well, it is a versatile vehicle—carries troops or cargo across water or land—doesn't even stop in going from one to the other. Say, if only I could do likewise—drive straight ahead without a stop and with all our people aboard—in going from war products to peacetime products.

Then, hop aboard the vehicle used by builders of the "duck", the Liberty ships, the M-4 tanks, the bombers and fighters, and hundreds of other war products. They went from peacetime products to war equipment almost overnight. Their vehicle is WELDING.

Sounds logical. Welding does simplify design . . quickens tooling up . . speeds production . makes selling easier because it makes products better and cheaper.

And one more suggestion Learn how to drive this V-day vehicle fast and straight with Lincoln's aid on welded design and procedure Start NOW



Early Diamond Tools

By PAUL GRODZINSKI, London

RECENTLY I presented in these columns, * some data on polished diamond tools which were used over a hundred years ago. Now I would like to refer to some old literature dealing with the cutting of hardened steel by shaped diamond tools.

It may be necessary to recollect that nowadays, shaped diamond tools are recommended for relatively soft materials i.e. non-ferrous metals and non-metallic substances. Only in exceptional cases is the turning of cast iron and steel recommended. For instance, the turning of cast iron liners for engine cylinders is generally handled with carbide tools altho diamond tools may be used occasionally. But, according to my knowledge, diamond tools are used only in extreme cases for the shaping of hardened steel parts.

Some references in older literature bear on the use of diamond tools for hardened steel. Some very detailed information is given by John Jacob Holtzapffel, son of Charles Holtzapffel, in Turning and Mechanical Manipulation Vol. IV., London 1881, which is reproduced in condensed form:

Most cylindrical forms turned in soft steel, when subsequently hardened, more or less lose their axial truth in the process. They are in some cases "hacked" with a hammer, upon portions intentionally left soft, to bring the hardened portions back to truth, or the latter are ground true with emery (*1). The **diamond** affords a convenient and somewhat less tedious means of rendering these portions true.

The diamond is used to a limited extent (*2) as a hand tool, for turning such works as small hardened steel pivots, but more frequently in the slide rest. The hand tools are made of little fragments, split off from the stone in the first stage of its preparation as a gem, an angle of the fracture containing a portion of the external rind of the stone being preferred for the cutting edge. These pieces called diamond bort are inserted in the ends of brass or steel wires (*3) either in their split ends, or more generally in a hole pierced in the direction of the length of the wire. The stone is held by its largest part by pinching in the metal around it, by brazing, or sometimes by melted shellac.

* May 1943 Blue Book

REYNOLDS Coolant Systems for Machine Tools



No. 1-S (Right)—Approximately 7 gal. p.m. capacity; 16"x10"x11" tank. 1/4 H.P. motor. For Milling and Screw Machines, lathes, etc. $98.50 each for 110 volt, 1 phase model, and 220 volt, 3 phase model. 550 volt, 3 phase model—$108.50.

No. 206 (Left)—Approximately 15 gal. p.m. capacity. Tank 20"x16"x16". 1/4 H.P. motor. For grinding machines, multiple spindle drills. $95.00 for the 110 volt, 1 phase model, and 220 volt, 3 phase model. $112.00 for the 550 volt, 3 phase model.

Dealers Write For Resale Discounts.



REYNOLDS MACHINERY CO., 211 EDDY ST., PROVIDENCE, R. I.

"Schultes"
. . . THE KING
OF MOTOR DRIVES!



Showing a Mueller Lathe

ALL HELICAL GEARED, UNSURPASSED IN POWER, EFFICIENCY, SAFETY AND COMPACTNESS

Write for Complete Detailed Specifications

WESTLOF TOOL & DIE COMPANY
4192 BELLEVUE AVE.
DETROIT, MICHIGAN

The tool cuts by the extreme point, and is constantly supplied with water, (*4) that neither it nor the work may heat. All the diamond tools produce the best results upon the hardest steel, less so upon portions less hard, and are inefficient upon soft steel, upon which they drag, compressing or burnishing a bright surface marked with occasional lines, rather than cutting.

"They require a very slow traverse and very slight depth of cut, to avoid risk of breaking the delicate point, and according to its diameter, a comparatively slow revolution of the work, (*5) less than half the usual speed for turning steel with the ordinary hand tools. Skilfully used, they may be made to turn absolutely hard steel to a true and perfectly polished surface or cylinder, removing the material in the form of minute turnings. Caution however is requisite in the advance of the tool in turning the arris (*6) formed by these two; the intense hardness of both tool and work rendering this angle rather liable to partial fractures.

"For works of increased dimensions, a similar but larger fragment of the stone is brazed into a stout steel wire which is inserted in the end of a rectangular iron stem for the slide rest. This enables the tool to be carried quite into an angle in the work; for plain cylinders, the stone is fixed directly in a hole made in the end of the iron stem.

"Larger and stronger forms, different varieties of the diamond, which are remarkably permanent, are also employed. The Brazilian "ballas or ball bort" occurs in small quasi-spherical nodules, partially translucent, and also differs from the odinary diamond in being an aggregation of crystals, possessing a radial instead of the octohedral fracture. Pieces about the size of a pea are placed in the end of an iron stem, brazed in, or the iron punched down around them, care being required in setting by the latter method to avoid cracking the diamond, very little of which is left exposed. Ballas cuts or rather abrades the steel by its rough exterior surface, formed by the ends of the collected crysals; its action is hardly so rapid as that of the previously mentioned tools, neither does it leave quite so good

FORD



The complete line—a *right* tool for every filing need. Write for catalog showing many shapes and sizes. M. A. Ford Manufacturing Company, Inc., 746 W. First St., Davenport, Iowa.

Rotary Files—Fast cutting, hard biting tools—made from a special grade of high speed steel. Hand cut by long-experienced craftsmen, then scientifically heat treated to stay sharp longer—and to last longer.

Ground Cutters— Miniature milling cutters, ground from solid *after* hardening. Special high speed steel stock. Precision ground, economical tools that can be sharpened many times to renew their original keenness.

THE MARK OF A GOOD FILE

FORD

GROUND CUTTERS ★ ROTARY FILES

a surface, and as with all, it requires a constant supply of water.

"Carbonate, (*7) the hardest of the Brazilian diamonds, a non-crystalline substance, opaque, and ranging in color from dark brown to nearly black, has an amorphous fracture. Some specimens contain numerous small irregular cavities, and under the microscope the appearance fairly resembles coke. Small pieces ranging in size from one to three carats, according to the magnitude of the work, are employed for turning steel, mounted as before in the end of an iron stem, leaving an angle of the fracture slightly projecting.

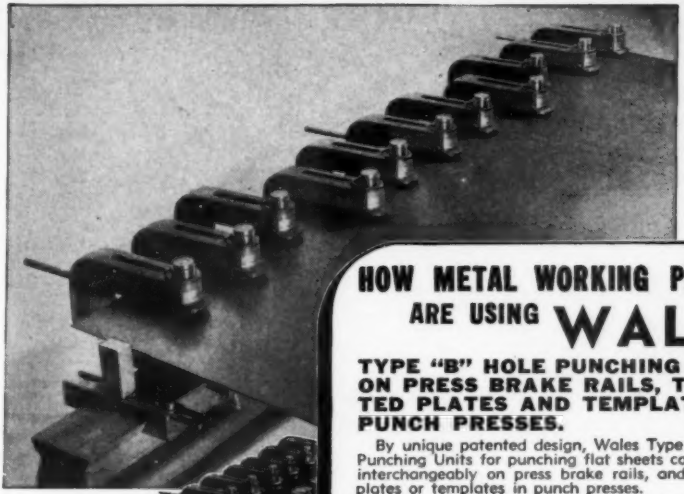
"The carbonate, altho strongest of the tools, is still most efficient in the ordinary lathe when used like the others, with only a slight depth of cut, usually not exceeding one to two thousandths of an inch, the continued repetition of which gradually reduces the work to truth, leaving it smooth and highly polished. Increased depth of cut, the hardness of the work, its want of truth in revolution and the intense hardness of the tool, all combine to exert so great a stress as to bring the latent elasticity of all parts of the apparatus into play. The tool continues to cut, but its effects are irregular and unsatisfactory. In more massive lathes, the depth of cut may be proportionately increased, provided the work be also of sufficient stability. Its effect upon the latter, as in all other turning, unerringly points out the extent to which the depth of cut may be carried safely."

The material is ordinarily removed as minute particles, reduced copies of those produced by the graver; but in the course of experiments upon an absolutely hard steel cylinder, ⅝" in diameter, made with a carbonate tool kindly placed at my disposal by J. Ker Gulland, C.E., the angle of the diamond was occasionally found to remove delicate spiral turnings about four inches in length, and but the two thousandth part of an inch in thickness. These minute, but otherwise precise copies of the long spirals produced in ordinary iron turning in the slide lathe, may be considered as rather remarkable in turning hardened steel"

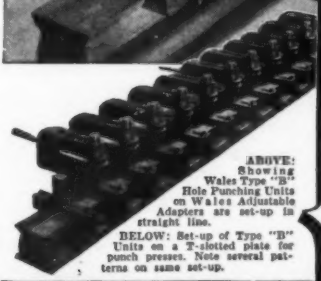
(*1) This method, i.e., the grinding of hardened steel parts has now became the standard method.
(*2) This sentence is quite in conformity with data contained in the Manual on single Point Cutting Tools (ASME) 1940).
(*3) Details were given in Vol. I of the mentioned textbook, but today more effective methods are in use.
(*4) This is not in conformity with the present day practices where the diamond tool is used without coolant, and sometimes compressed air is applied for cooling and for removal of chips.
(*5) Also this is contrary to the present day practice where the highest speeds are recommended.
(*6) An expression not much in use today.
(*7) Modern expression—carbon or carbonado.



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Safety-Engineered, Precision-Built, Shop-Tested
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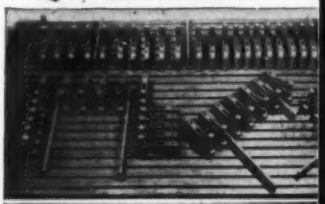


LEFT: Showing staggered pattern set-up for punching holes in sheets on press brakes. This is made possible by Wales Adjustable Adapters.



ABOVE: Showing Wales Type "B" Hole Punching Units on Wales Adjustable Adapters are set-up in straight line.

BELOW: Set-up of Type "B" Units on a T-slotted plate for punch presses. Note several patterns on same set-up.





HOW METAL WORKING PLANTS ARE USING WALES

TYPE "B" HOLE PUNCHING UNITS ON PRESS BRAKE RAILS, T-SLOTTED PLATES AND TEMPLATES IN PUNCH PRESSES.

By unique patented design, Wales Type "B" Hole Punching Units for punching flat sheets can be used interchangeably on press brake rails, and T-slotted plates or templates in punch presses.

Set-ups on T-slotted plates and templates are quickly made by simply bolting the units in exact position according to master pattern. Each unit is independent and self-contained with punch and die held in constant alignment by holder. This makes it possible to set the units in any location on plates. Units are easily moved or replaced in set-ups so they can be used and re-used to eliminate costly "dead storage."

For press brake set-ups these units are clamped on Wales adapters which are clamped to Wales press brake rail. The adapters are designed for front to back adjustment to provide staggered as well as straight line hole patterns.

Other time-saving, money-saving features built into Wales Type "B" Hole Punching Units:—

Nothing is attached to press ram . . . punch and die holder is a self-contained unit . . . punch and die are always in perfect alignment eliminating the usual time-consuming adjustments required to line up punches and dies of conventional set-ups . . . interchangeable punches and dies to punch various sizes and shapes with same holders . . . die setting time and press "down time" are cut from hours to minutes.

"There's Always Something New in the Wales Line."

Keep posted by writing for Catalog "B"

WALES-STRIPPIT CORPORATION
GEORGE F. WALES, President
NORTH TONAWANDA, N. Y.
Specialists in Punching and Notching Equipment

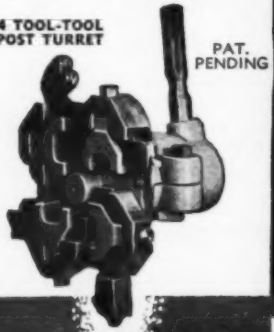
LEFT: Template set-up of Type "B" Units for punch presses.

Speed Production - Cut



Photo above shows Jefferson Turrets on 16" lathe





CONVERT YOUR ENGINE LATHE INTO A TURRET LATHE IN 15 SECONDS . . . Yes it's as easy as that. You simply attach the Jefferson Tail Stock Turret, and the Jefferson Adjustable Pull Feed to your lathe as shown in above illustration.

The productive capacity of these machines will be more than doubled because there is available at all times nine different tools.

With these three JEFFERSON time saving devices attached to a lathe, any kind of work may be done, such as forming, roughing, boring, finishing, knurling, drilling, tapping, etc. without stopping the lathe or changing tools. Substantially built, rigid, and extremely accurate. Made in several sizes to fit bench lathes and lathes up to 24" swing. DELIVERY 6 DAYS.

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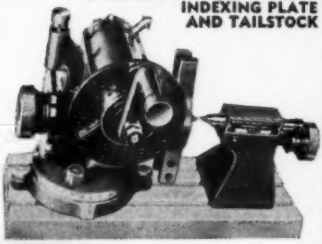
700 W. FOURTH ST.,

labor Cost - With these time saving tools!

6" TILTING DIVIDING HEAD
WITH 3 INDEXING PLATES AND TAILSTOCK:



7½" SWIVEL BASE DIVIDING HEAD
3 INDEX PLATES, ONE RAPID INDEXING PLATE AND TAILSTOCK



6" TILTING DIVIDING HEAD. Actual swing 6". The utmost in a well balanced, rigid, accurate dividing head. Material and workmanship of highest grade and made to close inspection. IMMEDIATE DELIVERY.

7½" SWIVEL BASE DIVIDING HEAD. Indexing by means of a 40 to 1 ratio Worm & Worm Gear, and a 24 notch rapid Indexing plate. Swivel Base is graduated 360° with 1° graduations. Adjustable tailstock with clamp lock for center. Spindle and centers hardened and ground. IMMEDIATE DELIVERY.

PRECISION MILLING MACHINES are built with exceptional sturdiness in every detail. They combine fast accurate production with ease of operation. Capable of close tolerances and a large volume of work. Proven ability and low cost performance on operations such as die sinking, contour profiling, angular milling, jig boring, routing, plus practically all essential milling operations on ferrous and non ferrous metals and plastics.

JEFFERSON PRECISION MILLING MACHINE



MACHINE TOOL CO.

CINCINNATI (3), OHIO



From 30 Minutes *and all of operator's time* **to 15.8 Minutes** *and half of operator's time*

Lot Size 200

Both operator and machine worked to capacity to obtain one part every 30 minutes. Time was cut to 15.8 minutes, complete lot finished in half of operator's time.



From 17 Minutes to 7 Minutes

Nine different sizes of these airplane propeller shaft sleeves are turned on a Sundstrand Automatic Lathe. Set-up changeover is less than 30 minutes. Quick set-ups for short runs are made easily.

Lot Size 200



From 45 Minutes to 5 Minutes

Lot Size 30

One of approximately 100 different jobs turned on two Sundstrand Automatic Lathes.

Lot size on the other jobs ranges from 25 to 100 pieces

One man operates both machines. Set-up time on all jobs averages 45 min.; savings run as high as 95% over former method.

Are You Losing TIME on Jobs Like These?

Sundstrand Automatic Lathes Increase Production on both Short-Run and Mass Production Turning

These examples of time savings available from Sundstrand Automatic Lathes have been taken from the actual experience of only a few of the many users of this modern equipment.

All of the advantages of multiple-tool turning are available on *both* short-run and mass production work. Study these brief sketches and compare the production figures with parts similar to yours...then get the whole story for equivalent or better savings on turning work in your own plant.



(Above) Installation view of Model 10 Sundstrand Automatic Lathes machining gear blank shown at extreme right, above.

These Exclusive Features Make It Possible to Obtain This Higher Production

Seven machine design features govern the possibility of turning short-run work on Automatic Lathes otherwise limited to mass production turning only. They include (1) Wide range of carriage cycles, (2) Adequate feeds and speeds, (3) Quick cycle change, (4) Simplicity of adjustment, (5) Adequate power, (6) Automatic cycling and (7) High rapid traverse rate. Sundstrand Automatic Lathes have all seven. One of the most important of these is:

Quick Cycle Change for Faster Set-ups . . .

Quicker set-up and easy change-over are possible because of the Sundstrand simple cycle control. This control eliminates making cams for every job to be turned. Another important feature is a:

Wide Range of Tool Action . . .

A wide range of action for front carriage tools is provided by three units used separately or in combination. Many combinations are possible by merely making simple adjustments.

How to Turn Short-Run Work Faster . . . is illustrated in this Free booklet. Ask for Bulletin 415.

(Right and below) Cycle Control Disk





Let Sundstrand Engineers Help You Select the Proper Automatic Lathe to Suit Your Work

...and make tooling suggestions for faster turning of *both* short and long-run work. This competent staff of engineers is available to study your problems and suggest changes for increased production, lower costs. Send complete, accurate information with each inquiry.

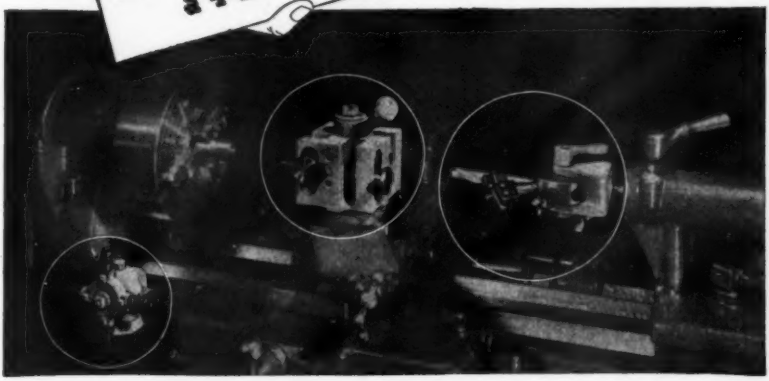
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• SPECIALTIES CROSS-SLIDE TURRET enables multiple machining operations on the same lathe. 4 working positions, ties up only 1 lathe. No stops to change tools.

• SPECIALTIES TAILSTOCK TURRET quickly converts engine lathe into 4-way turret lathe for end work. Cuts machine costs. You get 4 different operations with 1 tool.

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Here is an ideal production team for turning out vital war material in less time, with greater efficiency. Simply use the coupon for details on SPECIALTIES lathe accessories.

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SPECIALTIES Manufacturing Co., Inc.
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Please send me full information on SPECIALTIES lathe accessories.

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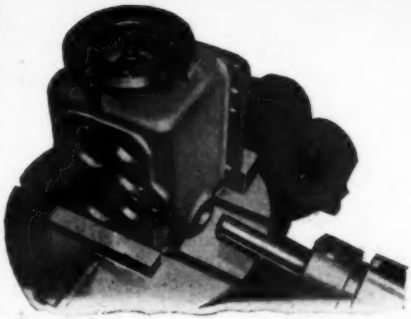
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THIS JOB CAN BE BORED IN A *Single* SETUP

IT'S NO TRICK WITH THE AUTOMETRIC MODEL B



This interesting boring job requires a minimum of setup time on the Autometric. Holes on all four sides of the gear case were accurately bored in relation to the large vertical bore — in one complete setup. Note that the hole is on a 15° angle.

The many-purpose Autometric Model 8 is designed for *today's* requirements —precision boring of a wide variety of mechanical parts. It handles a complete job in a single setup—faster and more accurately. Its simplicity makes training of operators easy.

Features of the AUTOMETRIC MODEL B

- Errorless measuring by the more rapid and more accurate AUTOMETRIC Method.
- Infinite variation of spindle speeds by fingertip control.
- Infinite selection of feeds by fingertip control.
- Steel Ways — hardened, ground, and super-finished.
- Spindle direct V-Belt driven — free of vibration.
- Well-ribbed body casting for permanent alignment and rigidity.

Write for full details of the Model B Autometric Jig-Boring Machine



BUY VICTORY WITH AT LEAST 10% IN WAR BONDS

Rotary Head Milling Machine
Autometric Jig Borers
Center Scope

Kearney & Trecker *Products*
CORPORATION
Milwaukee, Wisconsin
Subsidiary of Kearney & Trecker Corporation

Milwaukee Face Mill Grinder
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THE "PAY AS YOU GO" INCOME TAX LAW

By ARTHUR ROBERTS

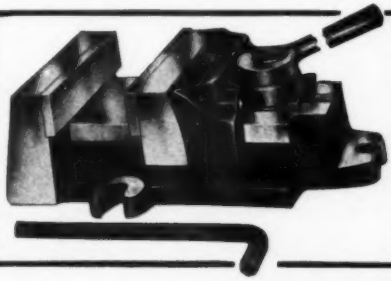
THE current tax payment Act of 1943, popularly known as the "Pay-as-you-go" income tax law, does not impose new taxes on individuals but provides for the collection of tax on income as earned and designates the proper procedure. The benefits of this Act are limited to individuals, not to estates, trusts or corporations.

This act concerns withholdings from wages of employes, hence, the employer becomes a temporary collector for the government and this complicates payroll procedure. Numerous new sections have been added to the Code to cover payroll withholdings and this legislation begets the employer a bigger payroll job. All existing provisions for figuring taxable net income remain the same. The new Act relates solely to the method of payment and collection of tax. Aside from payroll deduction, it does not touch any previous regulation covering an element of business operation such as depreciation or bad debts.

Twenty per cent of wages and salaries in excess of exemptions must be withheld from the employe's pay by the employer. Tax-rate schedules with instructions are provided by the Internal Revenue Department in Circular WT, which you should read carefully, and inasmuch as payroll withholdings went into effect July 1, 1943, all employers should be familiar with the general deduction practice by now, so I shall not take up white space detailing the method of computing withholdings, but rather, discuss the features of the Act that users of tools and machinery have queried me about.

Wages constitute any form of remuneration paid, salaries, bonuses, overtime, commissions on sales, percentages of profit, hourly, daily, weekly or monthly compensation paid in cash, stocks, bonds or other property. Wages paid in any other medium than cash must be computed at fair market value at the time of payment. The tax on such wages must be paid in cash and it is up to the employer and employe to see that such cash is made available. Vacation allowances, dismissal wages and deductions from employe's pay for taxes, social security, war bonds, etc., are wages. If an employer pays an employe's tax liability, without deducting it from his wages, under a state unemployment compensation law, the sum must be included in wages.

The Act does not specifically cover traveling and other expenses but it appears that the same rule will follow that



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Designed for production work, using an eccentric motion to apply pressure to jaws.
Eccentric motion moves jaw 5/16".

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Pressure between jaws, with handle furnished, 2200 lbs. Net weight 36 lbs.
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CERROBEND (Melting Temp. 158° F.) Used as a filler in bending thin-walled tubing to small radii. Easily removed in boiling water. Also used for aircraft assembly jigs, templates for forming dies and other purposes.

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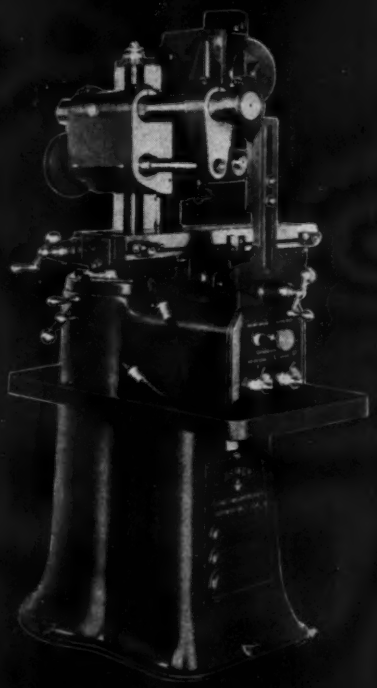
40 WALL ST. **NEW YORK CITY**

of the Victory Tax, which states that "amounts paid or reimbursements made to employes specifically for traveling or other expenses incurred in the business of the employer", are not subject to withholding. In certain cases, there may be doubt as to whether an individual is an employe or not and this must be determined by an appraisal of the relationship. Generally, an employe is subject to the will and control of an employer, not only as to what shall be done but how it shall be done. The right to discharge is also an important factor, indicating that the person possessing that right is an employer. An employer may be an individual, a corporation, a partnership, trust, estate, joint-stock company, association or other unincorporated group.

There are two methods of computing the withholding tax, the "exact percentage calculation," or "prescribed percentage rate", as Circular WT describes it, and the "wage bracket" method. The employer may use either one, and he may exercise this option between one employe and another, using one method for one employe, the other method for the next. Wages may be computed to the nearest dollar under the "exact percentage calculation", when figuring the amount to be withheld, but this provision is new and apparently does not apply if the wage payment ends in an even half dollar, (say $32.50). If the wages are rounded off, a fractional part of a cent may be disregarded in the tax computation unless it is ½ cent or more. The employer must collect 20 per cent of the excess of each wage payment over the "family status withholding exemption," as listed in a table, which is part of the law. The employer should have a copy of this law on hand to make sure his withholdings are correct. The 20 per cent figure includes 3 per cent net Victory Tax and 17 per cent, calculated to approximate the normal tax yield of 6 per cent and the first-bracket surtax of 13 per cent on wages.

The withholding exemption is determined by reference to the employe's payroll (the period for which a payment of wages is ordinarily made), without regard to the time the employe works during the period and without regard to the basis of computing compensation. The same rule applies whether the "exact

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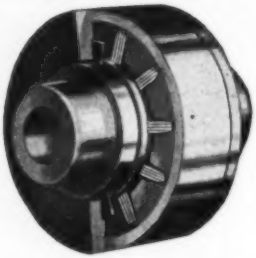
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If you want steady, uninterrupted production — lower machine-repair costs and freedom from misalignment troubles, take advantage of the long-lived CUSHION TORQUE developed by the KANTI-LEVER COUPLING. It not only protects you against misalignment like the ordinary coupling, but it goes several steps further and cushions your Motors and Productive Machines against the wear, vibration and fatigue that are the source of most machine failures. No other coupling is like the —

Kanti-lever Coupling

It has a circular series of laminated, resilient Cantilevers of 200,000 lb. steel operating in taper-side slots. End thrust is impossible: leverage on the cantilevers decreases automatically with increased load: safety stops prevent damage from extreme overloads: special end-float obtainable up to four inches without increase in cantilever stresses: outer periphery can be used as a brake drum for quick-stopping machinery. Over 3,000,000 H.P. in service. SEND FOR BULLETIN No. 28-B.

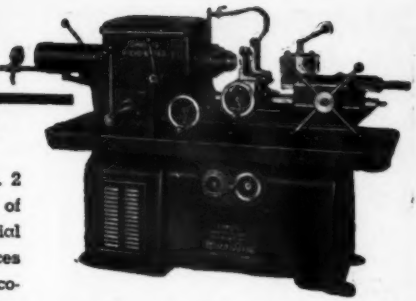
BROWN ENGINEERING CO., 126 N. THIRD ST. READING, PA.

percentage calculation", or "wage bracket" method is used. For example, a taxpayer has a biweekly payroll period. An employe, single with no dependents, whose wages are determined on an hourly basis, works 16 hours and earns $24 during the biweekly period. The withholding exemption will be that for the biweekly period ($24 is the minimum) and no withholding is required. A schedule showing withholding exemptions by payroll periods is given in the law. Where payments additional to wages are made, prior regulations decreed that only one withholding was allowed for the total payment, and this rule would apply. For example, to a salesman paid a salary plus a commission on sales; a worker paid a specific hourly rate with a bonus for output where the payroll period is weekly; an office worker paid a fixed wage plus time and a half for overtime during the period.

Under the "wage bracket" method, the government supplies five tables—weekly, biweekly, semimonthly, monthly and daily or miscellaneous payroll periods. These tables are part of the law. A "miscellaneous payroll period", not defined under the Victory Tax, means a payroll period other than those just mentioned. If the employer, for example, pays every 10 days, this is a "miscellaneous payroll period". The tax withheld under the "wage bracket" method is a single sum corresponding to the 20 per cent figure used in the "exact percentage calculation", and takes into consideration the status of the taxpayer as reported in his withholding certificate exemption.

Remember that withholding does not affect the liability for income (including Victory) tax. Because an employer is not subject to withholding, does not exempt him from tax. The individual employer doesn't receive a salary in the eyes of the income tax law. His income is his net profit. From the standpoint of good accounting, the individual employer should continue to consider he receives a salary, otherwise, this expense will not be included in his costs and he would short-change himself when computing selling prices. From an accounting standpoint, his net profit is what is left after his salary and other expenses are de-

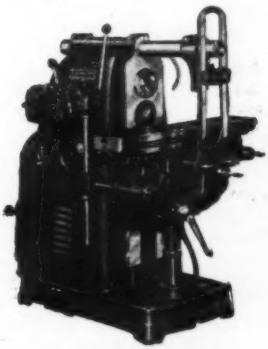
SIMMONS



No. 2 TURRET LATHE

A production standby, the Simmons No. 2 Turret Lathe handles an infinite number of diversified parts with very little special tooling items. Low in cost, it produces close-tolerance work speedily and economically. The *MICRO-SPEED* Drive offers unlimited speed variations while the spindle is in operation, enabling quick selection of the speed best suited to the work and cutting tools. Made in Plain and Back-geared types (the latter illustrated). *Write TODAY for details and delivery dates.*

SPECIFICATIONS
Bar Capacity — 1¼";
Swing Over Bed — 14";
Swing Over Cross-Slide — 6".



SPECIFICATIONS
Speeds — 64-710 R.P.M.;
Range of Feeds — Horizontal — 34", Cross — 8", Vertical — 18½"

No. 1A MILLING MACHINE

Inexperienced operators quickly learn to produce small, high-precision parts on the Simmons 1A—whether long production runs or small-lot work with frequent set-ups. Through *MICRO-SPEED*, an infinite number of speed changes can be made while the spindle is in motion by means of the Selector Dial. *Write TODAY for complete details.*

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Another slip . . . another reject . . . valuable man-hours lost, critical materials spoiled! That's what happens when work slips in a vise. That's why so many plants doing important war work use Parker Vises!

Parkers grip work evenly, firmly . . . with accurately controlled pressure. No slack to take up when gripping or releasing because precision-built Parker Vises respond to the slightest turn of the handle! Pinned-on tool steel jaws, covering the vise-top, lengthen the life of the tool . . . are easily renewable. The Charles Parker Company, Meriden, Conn., U. S. A.

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ducted from sales and this procedure should still be followed, but when filing a return, he cannot include his salary as a part of overhead expense. As an employer under the new Act, the individual does not withhold part of his own compensation but estimates his income on September 15th and then files an adjusted return in March.

This act also forgives the liability of any individual for 1942 taxes as of September 1, 1943. Where the 1942 tax is not greater than the 1943 tax, the 1942 tax is completely forgiven, if not more than $50. If more than $50, the 1943 tax must be increased by 25 per cent of the 1942 tax.

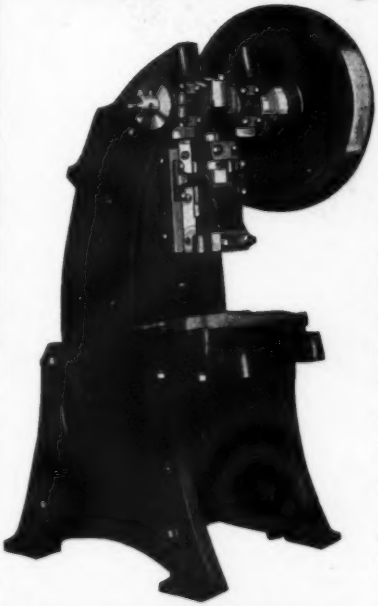
Where the 1942 tax is greater than the 1943 tax, including the Victory Tax, the amount to be added to the 1943 tax is the sum of—(1) the excess of the 1942 tax over the 1943 tax and (2) if the tax for 1943 exceeds $50, an amount equal to 25 per cent of the 1943 tax, or the excess of the 1943 tax over $50, whichever is lesser. The amount in (2) shall in no case exceed 25 per cent of the 1942 tax or the excess of such tax over $50, whichever is the lesser.

The Victory Tax as a separate levy will be collected from few employes; only those who owe no regular income tax and then the tax withheld should be at least 3 per cent of the excess over the prorated Victory Tax exemption of $12 weekly.

Be sure to open an account called "Pay as-you-go" tax collections, or preferably, use a payroll form specially prepared for social security, wage and hour, withholding, Victory Tax and other deductions from wages of employes. There are so many deductions from wages today that a special form is a time-saver. Someday, let's hope, the government will combine all Federal taxes into one, so that just one deduction is necessary from wages and likewise when computing the tax on income.

For Fire-power Now—
For Post-war Spending Power—
Invest in War Savings Bonds.

★ GET THE JOB DONE !



You can RELY on Marshalltown Presses TO STEP UP YOUR PRODUCTION ! They are engineered and built to give you the best in dependable, trouble-free service, and they incorporate many outstanding advantages. Features of design include more die space—chrome molybdenum cranks, wrist pin connections.

Yes, for better production—for longer life—for the MOST FOR YOUR MONEY—choose

MARSHALLTOWN PRESSES

Get the facts today about Marshalltown Presses. Send for literature of the complete line .... capacities from 5 to 70 tons.

MARSHALLTOWN MFG. CO.

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The WYCO Line

Selected!

by Leading War Plants

WYCO Flexible Shaft Machines are "standing up" to tough requirements — are giving better service — because every machine is built to do the job for which it is sold — and does it!
Easily portable. Sound engineering has produced greater strength without wasted weight. Long-life shafts and better machines that produce more for every unit of power.

There are WYCO Flexible Shaft Units for every requirement.



Model 4-B

Prompt Delivery on Priority Orders.



WYCO Patented
Non-Metallic Innerliner.
Makes the Core last longer.
Run smoother — Transmit More Power.

Select the right machine and correct unit of power for best results.
Series 4 WYCO 1 H.P. Single Speed Grinders are made for continuous heavy duty work with a 6" wheel in structural iron works, foundries, tank and boiler shops, welding plants and all places where the wheel is to be taken to the work.

Three Models — No Difference in Price. 4-A — High Base — for work at bench height. 4-B — Low base, low center of gravity. 4-S — Suspension type. Also available for uneven floors or open yard work, 4-T — same as 4-A but with WYCO "Roll-Easy" Truck base. Equipped with No. 4 WYCO 7 Ft. Flexible Shaft with WYCO Patented Non-Metallic Innerliner. This exclusive feature places WYCO Flexible Shaft Units in a class by themselves. Prolongs shaft life, eliminates friction, assures a vibrationless, truer running shaft.

Write for New Catalog.

WYZENBEEK & STAFF, INC.

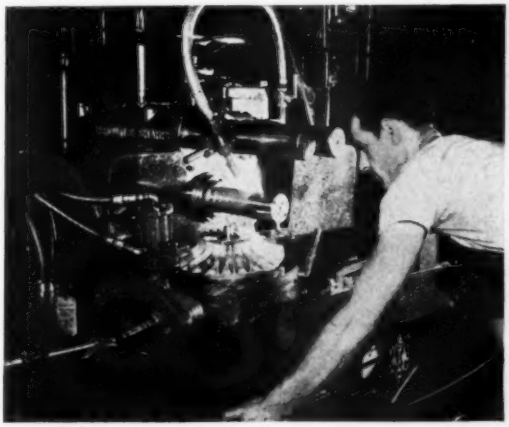
838 W. HUBBARD ST., CHICAGO, ILL.

"Let's Talk Shop!"

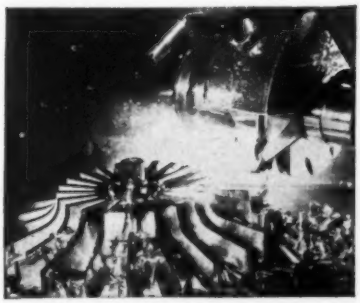
MACHINING SUPERCHARGER IMPELLERS

FLY cutters with cemented carbide inserts about three inches long have been found superior to conventional straddle-milling cutters in machining blades of impellers for airplane superchargers at General Electric. The cemented carbide inserts are said to last five times longer, without regrinding, than the multi-tooth milling cutters of high speed steels previously used.

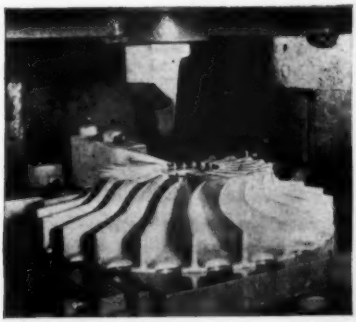
In the initial operation, the impeller is held in a fixture and hand indexed to machine each blade individually. A second milling machine with carbide-tipped fly-cutters, spaced at opposite diameters of the cutter bar, is used to remove the



Setup on the milling machine in which fly cutters remove triangular pads of metal between blade faces after initial machining. A special drive oscillates the impeller as the cut proceeds.



Close-up showing impeller blade being machined with a pair of fly cutters.



Punch and die setup for curving upper edges of blades.

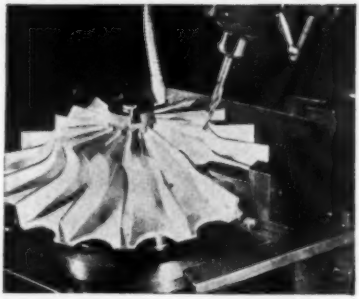
SPEED YOUR ★
RIVETING OPERATIONS ★ ★



WITH GRANT RIVETERS

A great help in War Production, these GRANT Riveters are available in Noiseless Spinning and Vibrating Hammer types. Also Vertical and Horizontal Multiple Spindle Spinning Machines.

GRANT
MANUFACTURING & MACHINE CO.
C E Station, Bridgeport, Conn.



Setup for drilling and countersinking hole in web between blades.

metal remaining in the triangular areas between blades from the first cut. The shape of the pads of metal to be removed requires that the work be oscillated to give a wider sweep at outer ends of cut. To accomplish this, the impeller is mounted on an arbor oscillated by a universal shaft driving thru a gear reducer. Sharp edges are then removed and the tool marks polished out.



GRAND QUIKCET

SETTING THE PACE ON EVERY PRODUCTION FRONT

Saving 90% of clamping time—new designs for high speed production work, one hand operation. Non-creep replaceable grips, proof-tested alloy steel construction of forged clamp capacity. Screws, rods and handles copper plated against welding spatter.

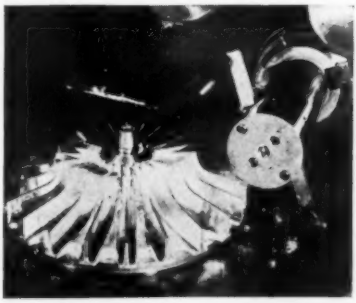
A complete line of modern time-saving clamps—both malleable iron and alloy steel: Dual Grip "C" Clamps; Heavy Duty Speed Clamps: Standard DeLux; Standard Alloy-Steel; and Quick Locket, the last word in modern clamp design.

Write today for circular





GRAND SPECIALTIES CO.
3132 W Grand Ave Chicago III.



Close-up of the cemented-carbide insert fly cutters.

Then the upper edges of blades are formed to correct curvature by a punch and mating die in a pneumatic press. Each blade is "curled" individually, the piece being hand indexed between press strokes.

The impeller is next transferred to a milling machine equipped with an angular head, and a hole is drilled and coun-

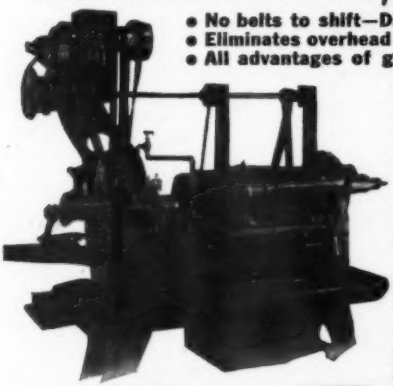


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TO INSTALL

TURNER
UNI-DRIVE
Motorizes Machine Tools

These Features are Responsible:

- **No belts to shift—Drives to large step of cone at all speeds**
- **Eliminates overhead line and counter shafts**
- **All advantages of geared head with belt drive smoothness**



NOW AT WORK FOR VICTORY ★★★

The high-speed, volume-production methods of wartime call for modern machines, modern methods. More speed... greater production...you must have them to keep apace! Enlist the aid of TURNER UNI-DRIVES. They'll increase production like an extra shift... save time... speed up work... keep down power costs. They're doing it in scores of shops and plants. They'll do it in yours. TURNER UNI-DRIVE is the *successful* one motor drive.

Easily and quickly installed. Increase the efficiency of machine and operator. One trial will thoroughly convince you.

Right now... today... investigate TURNER UNI-DRIVE. See your dealer, or write or wire us for full information.

IT DOES THE JOB on Lathes, Shapers, Milling Machines, Turret Lathes, Radial Drills, Boring Mills, Hobbing Machines and various machine tools. Also for Browne & Sharpe and Cleveland Automatic Screw Machines.

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MARKING & NUMBERING MACHINES HELP YOU DO A GOOD MARKING JOB.

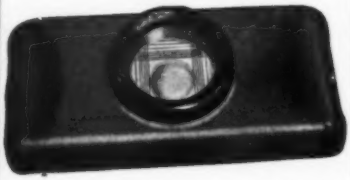
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FELL PRECISION LEVEL



A precision "all-way" level for use in machine tool building, setting up and maintenance, whether for establishment of level working surfaces or for the accurate checking of straightness where true level itself is not required.

Graduations are in .0005" per foot and form squares about a circular bubble, thus giving coordinate readings and showing the direction and amount of slope, if any. Made in two sizes—5½"x12"; 3½"x6".

Write TODAY for bulletin giving full details.

Wm. B. FELL COMPANY
700 South St. Rockford, Ill.

IMMEDIATE DELIVERY
TOOL POST TURRETS
FOR LATHES UP TO 16 INCH SWING. OTHERS BUILT TO YOUR SPECIFICATIONS
WRITE
UNITED AIRCRAFT PARTS MFG. CO.
HOLLYWOOD, CALIF.



ter-sunk with a combination tool in the web at points midway between blades. To do this, the work is located on a vertical arbor on the bed of the machine and is indexed by hand prior to drilling each hole. The work is located after each indexing by a slide with a block fiber at its inner end, tapered to fit between the side faces of the blades.

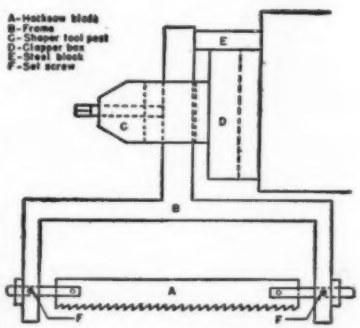
FAST GRINDING OF HARD STEELS

A new precision grinding wheel of open, cellular construction (No. 15 Abrasive Content) has recently been announced by American Emery Wheel Works, Providence, R. I.

This latest addition to the American line, specially designed for toolrooms, is described as a real metal-eater. Its open, porous construction is said to give plenty of chip-clearance and space for air cooling to cut hardest alloyed steels without loading or "burning." It is claimed that with it, deeper cuts can be taken—faster—with a good finish. In wet grinding, its porosity enables it to carry extra coolant, for cooler cutting. Not a premium-priced wheel, it is said to cost no more than conventional wheels and to last as long or longer.

SHAPER USED AS MECHANICAL SAW

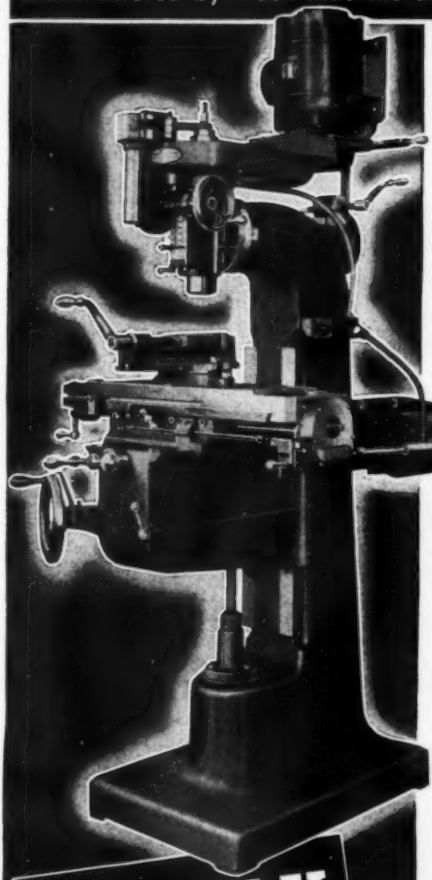
When small dimensional material must be cut accurately and no power saw is available to do the job, a shaper is occasionally used as a mechanical saw at General Electric's Schenectady Works.



SHAPER USED AS MECHANICAL SAW

INDEX MILLS

Manufactured by Index Machine and Tool Co., Jackson, Mich.



CHECK THESE FEATURES!

★ Precision Ball Bearing Spindle that will require no attention for two years.

★ Swivel Head which can be set 90° right or left.

★ Super construction sensitive enough to do work with end mills ⅛" diameter yet rugged enough to use ¾" end mills taking full cuts 24 hours a day.

★ Verniers for locating, and power feed to spindle for boring.

★ A versatile machine that can be used in the tool room or on the production line.

Send inquiries for immediate quotation and quick delivery to Factory Sales and Distributing Agents.

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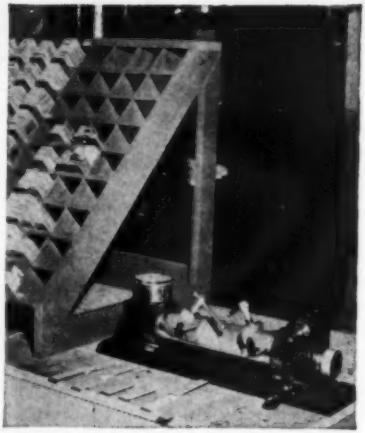
3100 E. MICHIGAN AVE.
JACKSON, MICHIGAN

As shown by the sketch, the arrangement consists of a metal frame with two standard blade holders. The "handle" projects vertically so that it may be inserted in the tool post of the shaper. Block "E" is placed so that it holds the clapper-box rigid. The setscrews "F" prevent the blade from twisting.

TESTING SPOT WELDS

A quick, simple method for shop testing strength and soundness of spot welds has been developed in the East Springfield Mass., plant of the Westinghouse Electric & Mfg., Co. Spot welding is usually tested by "pulling a button" but this only tells if the material actually welded, failing to give any indication of strength or soundness of weld.

A small shear testing machine is now used to make a thoro test. When an inspector desires to make such a test, he takes two standard test pieces, cleans the surfaces and makes the weld by overlapping the two pieces. The welded specimen is then clamped in the machine and a shear is applied. The force applied in pounds is shown by a gauge on the machine. A prepared chart shows the minimum strength required for the various thicknesses and types of material.



Advantages gained from the use of the shear testing machine are:—(a) aids in control of quality by giving a quantative value of the strength of the weld; (b)

BUILDERS 'T' SURFACE GRINDER

A full 10" vertical capacity from table top to bottom of 7" wheel permits surfacing numerous items previously handled only on large expensive machines.

Bench or floor models furnished.

Prompt Delivery
Send for Bulletin 644

BUILDERS IRON FOUNDRY
21 Codding St.
Providence
R. I.



for QUICK change-overs



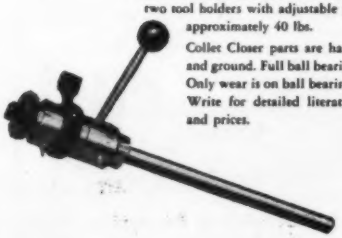
UTILITY TOOLS

In a matter of minutes you can convert your engine lathes into screw machines. Simply remove tail stock and install a Utility Turret and Crossfeed Cut-off. Turret has rack and pinion which assures steady feed. Raised bearing surface eliminates all chip trouble. Has two taper gibs for take-up and alignment. All ways and bearing surfaces are ground. All inserts, bushings and pins are hardened and ground. Hex is 5⅛" across flat, 2-7/16" thick. Accommodates a ⅜" hole or a No. 1 or 2 Morse taper. Fits Logan, South Bend, Atlas, Craftsman, 10" Sheldon, Clausing, etc.



Cross Slide pictured here has rack and pinion, two tool holders with adjustable jacks. Weight approximately 40 lbs.

Collet Closer parts are hardened and ground. Full ball bearing. Only wear is on ball bearings. Write for detailed literature and prices.



UTILITY TOOL and DIE MFRS.

GLENDALE • CALIFORNIA

Accurate Hole Transfer Made Easy With NIELSEN TRANSFER SCREWS



Simply insert in holes, invert, strike sharply and you have centers and drill circles perfectly located. Reduce time and eliminate spoilage of other methods. 7 sizes U.S.S.—Inexpensive—last for years.

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NIELSEN TOOL & DIE COMPANY
1962 W. Eleven Mile Road, Berkley, Mich.



NUMBERALL
Numbering Machines
Automatic and Hand Operated
for stamping in Metal, Fibre, Plastics, etc. Do faster and better work than Single Steel Stamps.
For Marking Metal Parts, Name Plates, Metal Checks, etc.
Write for Catalog.
NUMBERALL STAMP & TOOL CO., Inc.
Huguenot Park, - - - Staten Island, N. Y.

serves as a quick check on setup of spot welder: (c) compact and simple to operate, and (d) permits tests to be made by operator or floor inspector instead of a laboratory technician.

FIXTURE LOCATING DEVICE

A jig-borer plate for a retractable centering pin to locate work clamped to a master plate has been devised at General Electric's Schenectady Works for use where a large variety of small parts must be bored on a short-run basis. The arrangement allows the operator to change quickly from one job to another without relocating the center, and in addition, he can change from a fixture operation to a clamp-down operation without removing the jig-borer plate. Both holes tapped in the plate at 2" centers makes this possible.

The jig-borer plate is made of 1" stock, 15" wide and 20" long. An L-shaped leg at each end of the plate raises its top surface 4" above the table and provides a means for strapping the arrangement down.

The retractable pin, centered directly under the spindle, is raised or lowered by a shaft arrangement extended thru one of the legs. The pin slides thru a bushing set in the plate with a press fit.



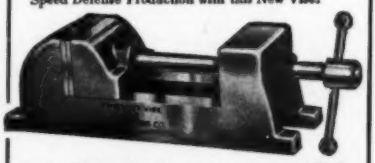
In fabricating the jig-borer assembly, the legs are welded to the plate, after which it is stress annealed. Holes are bored in the plate after it is trued with the table.

PYRO THE SIMPLIFIED OPTICAL PYROMETER



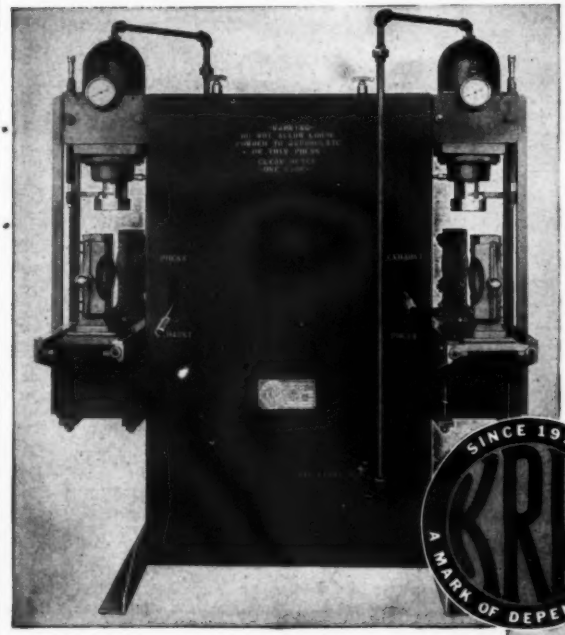
Unique construction enables operators to rapidly determine temperature even on minute spots, fast moving objects or the smallest streams; no correction charts, no accessories, no upkeep.
THE PYROMETER INSTRUMENT CO.
102-105 Lafayette St., New York, N. Y.

DOUBLE YOUR DRILL PRESS CAPACITY
Minutes are Seconds with the new TWISTITE Vise.
Opens to full capacity in one second.
Speed Defense Production with this New Vise.



J. A. Richards Co., Kalamazoo, Mich.

KRW HYDRAULIC ARBOR PRESSES

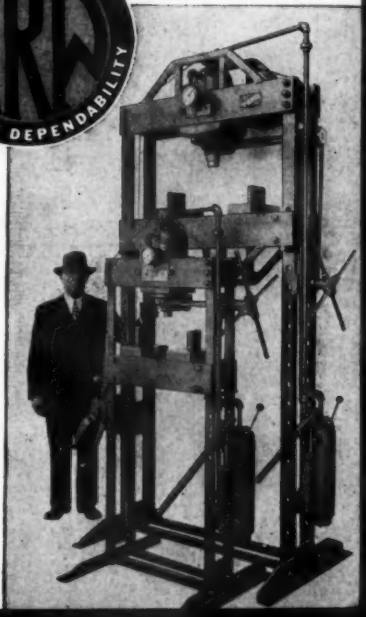


Engineered for War Production

Illustration at left shows a special, 4-man operated, air-oil press which is used extensively for bomb loading.

Illustration below shows a special extra high 75-ton KRW Hydraulic Arbor Press in comparison with the standard 25-ton unit.

SINCE 1916 KRW A MARK OF DEPENDABILITY



With standard KRW Hydraulic Arbor Presses as a work-proven basis, we have been able to speedily design and build many special presses for war production—without time-consuming engineering delays. The net result has been a greatly accelerated production of vital equipment which is helping to speed our Victory.

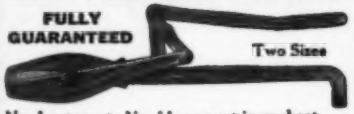
KRW also builds standard Hydraulic Arbor Presses in 25, 50 and 75-ton capacities in addition to bench-type Arbor Presses in 1/2, 1 and 3 ton capacities. If you have a problem that an arbor press might solve, write us.

K. R. WILSON

10 LOCK ST., BUFFALO, N. Y.

ALL ALLOY **PORTABLE SHEARS**

FULLY GUARANTEED



Two Sizes

No. 1 cuts up to No. 11 gauge strip or sheet.
No. 2 cuts up to ¼" steel plate.

Special Blades for shearing stainless steel.

BREMIL MFG. CO.
1720 Pittsburgh Ave., Erie, Pa.

★ **THE** ★
WONDER CUTTER



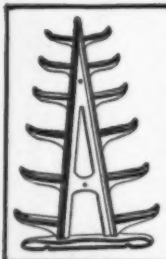
Small enough to go in any out-of-the-way place — yet it cuts wire and rods up to ⅝ in. round (⅜-in. square) and band iron up to ⅛-in. by 2-in.

Adjustable stop for gauging the length of pieces. Hardened cutters that last indefinitely.

Get the "dope" on the lowest priced cutter out—

THE WONDER

The Federal Foundry & Supply Co.
4602 East 71st St., Cleveland, Ohio

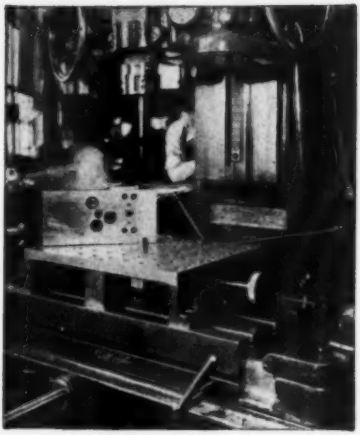


"CHAMPION" Steel Racks

Save time, steps and money by keeping bar stock, shafting and pipe out of the way and off the floor.

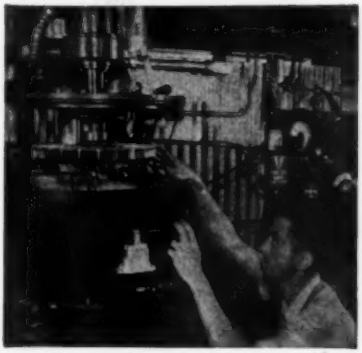
Write for full details.

The Western Tool & Mfg. Co.
Springfield, Ohio



The illustrations show close-up of operator using the fixture and close-up of fixture showing bottom of master plate; retractable pin in raised position.

SUPERCHARGER IMPELLER TEST

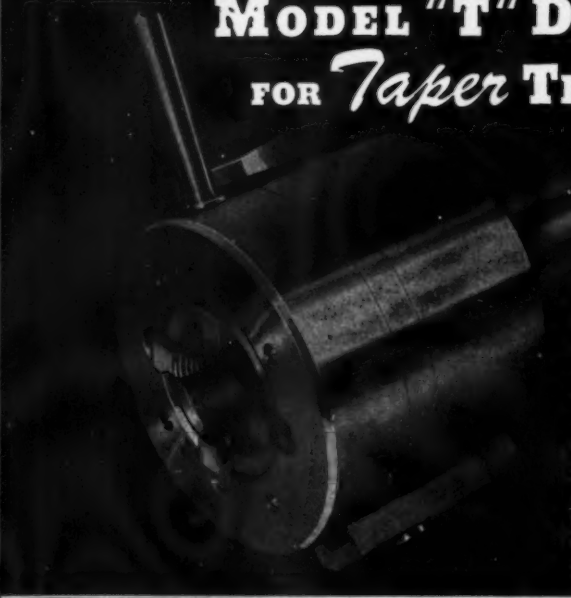


Impellers for airplane superchargers made by General Electric "grow" 0.003" when they are tested in this specially constructed heavy steel case at speeds of more than 20,000 rpm. The terrific centrifugal stresses caused by spinning so fast, make the aluminum alloy impellers take on a permanent set and become 0.003" larger in outside diameter than before the test. The case is exhausted to a high

Rickert Shafer

FOR 35 YEARS

MODEL "T" DIE HEAD FOR *Taper* THREADING



1. Mechanically correct way to cut taper threads.
2. Taper controlled exactly by profiles on outside.
3. Thread length controlled by internal or external trip.
4. Leaves no chaser marks on work when Die Head releases (an important feature on aircraft threads).
5. Longer chaser life.

RICKERT-SHAFER CO · ERIE, PA.

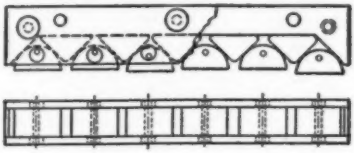
DIE HEADS · COLLAPSIBLE TAPS · BORING HEADS
TAPPING MACHINES · SPECIAL THREADING MACHINES

vacuum for each test so that the power needed to drive the impeller is relatively small.

HOLDS DIFFERENT SIZE PIECES

A universal pressure equalizer for clamping multiple pieces of different thicknesses which cannot be held in a standard clamping device has been developed by Daniel Wollpert of General Electric's radio transmitter planning department.

It is constructed with movable parts that allow pressure to be shifted and equalized across the face of the clamp. Multiple pieces then can be held tightly even tho there is a variance in their thickness due to machining tolerances.



HOLDS DIFFERENT SIZE PIECES FOR MILLING

The shifting of pressure is accomplished by allowance for movement of the equalizer parts, which consist of half round and triangular pieces. When there is a difference in thickness of the parts to be held, the half-round pieces shift their position and the triangular pieces shift into position behind them, holding the part securely.

The equalizer is primarily for milling and can be used with any standard or cam vise. It is adaptable for clamping either round or rectangular pieces as well as pieces with irregular surfaces such as castings. It can also be used as part of an assembly fixture. When used in a vise it is fastened securely to the movable jaw. The stationary jaw is then made to suit the shape of the parts to be machined and is spaced to match the equalizer.

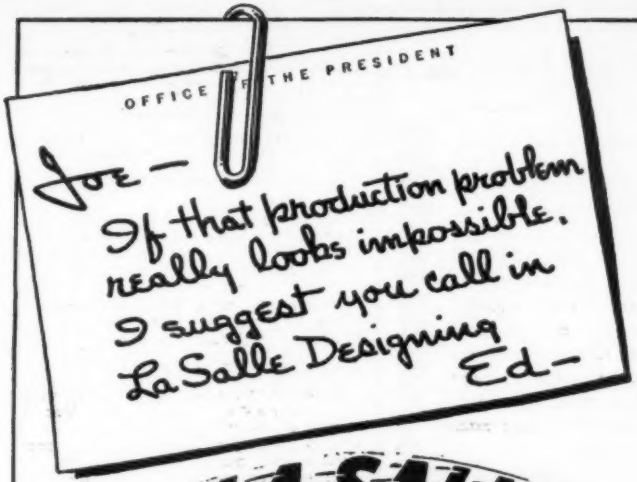
SMALL WORK ON LARGE TABLES

A device for securely clamping material of smaller diameter than the space between the T-slots of large milling machines has been devised and put into use at General Electric's Schenectady Works.

NEW CALIPER
SPEEDS UP DEFENSE WORK
Direct Reading Accurate, Fast, Simple. New timely tool SAVES TIME, SPEEDS UP PRODUCTION. Graduated scale, easily read at a glance. Adaptable to all types, shapes of work, wood or metal. Measures 0 to 4 inch.
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BIG-HED-NIBS
LOC-KEY-SET
RE-SET-ABLE
Cooler dressing
Closer tolerances
Micrometer Accuracy
Because: Wing key heat dissipation and absolute diamond lock nib.
Grinders instruction card free.
• Three grades of diamonds. Common quality $12 per karat. Medium quality $24 per karat. Select quality $48 per karat. (Contour template diamonds supplied only in Medium and Select quality.)
• All diamond sizes ¼ to 10 karat are nib mounted for immediate shipment . . . Billed subject to approval. Specify quality of diamond wanted. We recommend a minimum size of one karat for each 6" diameter of grinding wheel. (24 hour resetting service, $1.00 post paid.)
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VARIABLE SPEED TRANSMISSION
For "A" section V-belts—3.3—1 speed range—perfect belt alignment in all positions. Priced so low that no shop or machine need go without infinite speed selection. See your dealer or write $16.50
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MANAGEMENT ENGINEERING

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BRANCHES IN MILWAUKEE, DETROIT, LOS ANGEIES



EASY TO OPERATE
--and FAST. too!

New workers attain high production rates sooner because Rousselle Punch Presses (4½, 10 and 15 ton capacities) are fast and simple to operate and incorporate safety devices to protect both the operator and the work. Light jobs and small runs requiring frequent set-ups are produced faster at less cost, releasing your larger machines for those heavier, longer-run jobs. Write, wire or phone for details and name of nearest dealer.

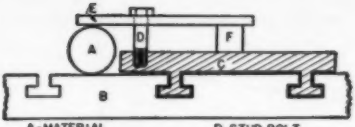
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ROUSSELLE INCLINABLE PUNCH PRESS
10 Ton Capacity

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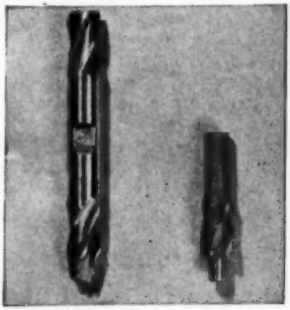
A-MATERIAL
B-MILLING MACHINE TABLE
C-HOLDING DEVICE
D-STUD BOLT
E-STEEL STRAP
F-BLOCK

MILLING MACHINE HOLDING DEVICE

As shown by the drawing, the device consists of a steel plate "C" with two T-shaped projections which fit the grooves of the miller table. A tapped hole near the end of this plate receives stud bolt "D". By tightening the bolt down on the block "F" and the work "A", the work is held firmly for machining.

BROKEN END MILLS

As another step in its tool conservation and salvage program, the Mansfield works of Westinghouse Electric & Mfg. Co., is making counterbores from broken double-end mills. In most cases, two counterbores are made from each broken tool. The illustration shows a counterbore made from an end mill of the type shown.



In making counterbores, the end mill is first annealed, then cut in half. Each part is then mounted in a lathe and a pilot machined. The counterbore is then backed off and rehardened.

Reamers and drills can be reclaimed in a like manner, making various tools from otherwise unusable scrap.

WINDING RANDOM COILS

An adjustable, quick releasing arbor for winding random coils for instrument-type motors has speeded the job and increased machine availability at one of

A Modern Way to Apply Abrasive Discs with DISTIC



★ Saves time and money . . .

★ Reduces machine tie-ups . . . . . .

★ Speeds up Production

Here is a shop-tested method, now in use by thousands of factories where old methods of changing and applying polishing discs consumed too much valuable time.

With DISTIC, changes are made in 15 seconds. It is clean, safe, odorless and non-drying. Doesn't require clamps and weights, dirty glue pots or mixtures.

All you do is to hold DISTIC against the rotating steel disc. When the disc is covered with a fine gummed surface, put on the abrasive paper and press down with your fingers. The job is done — and you can start right in working. Abrasive discs can be replaced or changed at a moment's notice.

Start now to use DISTIC and win the thanks of your workers.

SEND FOR YOUR FREE SAMPLE TODAY

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Box 763, Albany, N. Y.



3600 RIVET HEADS PER HOUR

....noiselessly

That's about as fast as an operator can handle the parts . . . which makes your production second to none when you use

LINLEY

ROTARY RIVET SPINNING MACHINES



Moreover . . . the noiseless feature boosts output still higher. It's tough on operators when a roomful of the old style hammer - blow riveters bang away. It's pleasant work with *silent* Linleys which smoothly roll out the heads with a highly polished finish. Made in both bench and floor styles from 3/16" to ⅜" capacity and for countershaft, horizontal motor or direct connected vertical motor drives. Floor or bench space varies from 5"x5¾" to 17"x28".

Write for detailed Bulletin to

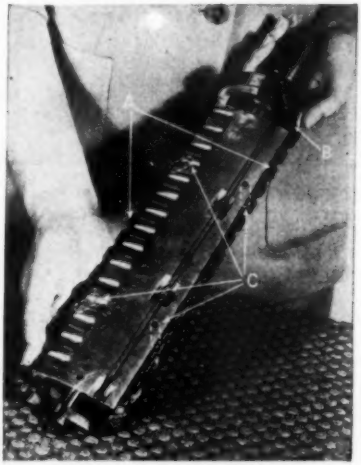
LINLEY BROS. CO.

663 STATE STREET EXTENSION

BRIDGEPORT, CONN.

General Electric's plants manufacturing aircraft parts.

The arbor was developed by F. W. Smith, a tool designer. It consists of two notched rails (A) over which the coils are wound, and a cam-ground surface on a lock nut (B) at the end of the arbor which moves the rails longitudinally. In each rail there are two cam slots (C) in which are located two guide pins which are firmly attached to the body of the arbor.



As the cam is turned, each rail is forced against the guide pins and the slot acts as a cam surface to force the rails outward to the position in which the coils are wound. The arbor is then completely wound with coils in an automatic machine. When the winding is completed, the cam is turned back to the semirelaxed position and the coils are tied, after which the cam is rotated until the slot in the cam is opposite the end of the rails. The rails then fall back to a reset position below the body of the winding fixture so that the coils can be removed from the arbor.

An important advantage of this type of arbor lies in the fact that coils for this particular type of motor are wound continuously in three phases of five coils each. The arbor permits three spools of wire to be used and three coils are wound simultaneously.



Make Your Cut-Offs with EMPIRE TOOL COMPANY'S

LUERS PATENTED

CUTTING-OFF BLADES

Their T-shaped design provides proper clearances where necessary. Excessive friction is eliminated.

The hollow-ground top of the blades causes chip to collapse and relieve friction against sidewalls of cut.

The pulling away of the chip from the sidewalls permits coolant to reach cutting edges, thereby lengthening blade life.

Being machine-ground accurately to definite standards for clearance, Luers Blades are uniform and dependable. Hand ground clearances are *never uniform* and thus tend to decrease production.

Since sharpening is required only on the front face, there is no need for supervision for this work.

In most cases the facing operation is eliminated because chip does not tend to mar sidewalls of cut, and it leaves face smooth.

The use of Luers Blades reduces number of scrapped pieces, because work is more accurate and has better finish.

Since the blades can be easily and quickly removed from and replaced in holders without disturbing original setup, loss in production is reduced.

Send for complete catalog giving detailed information about advantages in using these specially designed blades and holders. Made in models to fit any standard hand or automatic screw machines.

Blades, both tapered and parallel on the longitudinal cutting width, carried in stock.

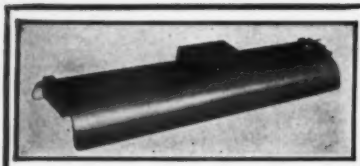
Empire Tool Company manufactures Luers Patented Cutting Off Blades and Holders under licenses issued by John Milton Luers Patents, Inc.

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The Blades that reduce friction

EMPIRE Tool Co.

8782 Grinnell Ave. Detroit, Mich.



Sharpen Sight... Increase Production *with* WILEY Fluorescent Fixtures

Fit this modern lighting to YOUR plant conditions in the easiest way by installing the new WILEY Instant Starting Fluorescent Fixtures.

Features include: Approval by WPB and National Bureau of Standards — Minimum steel construction permitting immediate delivery — No starting switches — No flickering — Greatly reduced maintenance expense — Longer tube life — Simplest installation method. Write today for full information.

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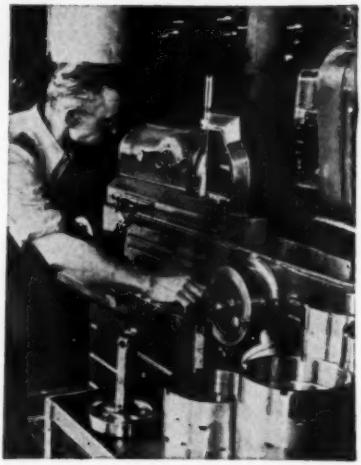
Name .....

Company .....

Street .....

City..... State.....

THREADING GUN COLLARS



War production speed-up, the tempo of the times, is probably best exemplified by this machine pictured in a gun plant of the DeSoto Division of Chrysler Corp. The slow, tedious task of threading collars on a heavy calibre gun formerly required 32 minutes. Here, with the aid of the new Ex-Cello-O machine, Felix Mendalski does the work in 8 minutes. Reason—the speed of the grinding wheel has been stepped up to 15,000 rpm. If the wheels of your automobile could be made to turn at that speed, you would be roaring down the highway at more than 1,000 miles per hour. DeSoto is currently installing a battery of these newly designed, high speed thread grinders. An added feature—diamonds automatically redress the grinding wheel at predetermined cycles.

ELECTRONIC MOTOR DRIVE

Application of a 1/3 hp Thy-mo-trol drive to a small drill press at General Electric's Schenectady plant has greatly increased the drill's field of usefulness. A range of operating speeds from 25 to 1750 rpm—obtained simply by turning a small knob on a push-button station—enables this simple drill press to do jobs that would otherwise require a much more complicated machine or machines.

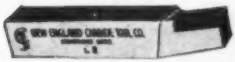
Speeds available are so much slower than those obtainable without changing



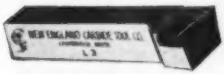
SPECIFY NEW ENGLAND *Standard* CARBIDE TOOLS



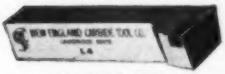
Tool Style No. 1



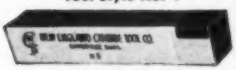
Tool Style No. 2



Tool Style No. 3



Tool Style No. 4



Tool Style No. X5



Tool Style No. X6

Styles 1 to 4 furnished right- or left-hand

New England *Standard* Carbide Tools are precision built—every tool is ready for the job, because correct radii and clearances are finish ground to correct tolerances. *Standard* tools are supplied with "U" grade tips for cutting aluminum, cast iron, brass, bronze and non-metallics, and in "S" grade for steel.

We will be pleased to arrange delivery schedules to produce your standard or special tools with any make or grade of carbide specified by you.

NEW ENGLAND CARBIDE TOOL CO.

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TUNGSTEN CARBIDE PRODUCTS • DIAMOND TOOLS • DIAMOND POWDER



Please send me your new Standard tool folder and a Standard tool wall chart for our tool room. **M.M.S.**

NAME_____ TITLE_____

COMPANY_____

STREET_____

CITY_____ STATE_____



pulleys on similar drills, that it can be used on hard-to-drill materials, such as molded compounds, and for fly cutting of large diameter disks. Since the drive permits reversing as well as independent adjustment of speed in each direction, tapping can be done at the proper preselected speeds for both tap and back-out.

Several hundred Thy-mo-trol drives of larger size are now said to be serving the war effort by providing precise, convenient control of machine tools and other equipments.

SAFEGUARDING WORK-SLIPS

By Frank V. Faulhaber

"We had so much war work", observed the assistant machine shop foreman," that we finally decided we had to do something about it!" He was referring to the boxes provided to take proper care of the employees' individual work-slips. In many shops, work-slips frequently go astray, and any omission may not be discovered until the worker notes a shortage in his pay-envelope. Resulting pay discrepancies may not be righted until the following pay-day; meanwhile the employee feels disgruntled. There may even be a question as to whether a worker really did perform a certain lot of work when there is no work-ticket to show for it. This concerns also the worker on a day basis.

YOUR FIRST LINE OF

DEFENSE against

HIGH SHARPENING COSTS

No. 57T

Automatically Sharpens Metal Saws in gangs up to 8" in diameter. Takes gangs up to 3½" thick. The saws are automatically indexed and sharpened within variation of plus or minus .001 of exact diameter of entire lot.

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THE WARDWELL MFG. CO.

3165 Fulton Rd. Cleveland, Ohio

MILLING - DRILLING - BORING ATTACHMENT

for

Heavy Duty Operations



Uses many types of cutters on a wide range of work. 1/16" to ¾" end mills.

FEATURES

Large size spindle with No. 9 B&S Taper. Large Quill Diameter with a travel of 4". Furnished with ½ h.p. motor.

The aluminum pulleys provide a range of six speeds, from 250 to 3000 R.P.M. The spindle takes 1/16" to ¾" end mills. Quill is counterbalanced and hardened and ground. Overarm brackets equipped with spreader screw for easy mounting.

PROMPT DELIVERY

Send for Descriptive Folder.

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CONWAY CLUTCHES

INSTALL . . . . THAT'S ALL

PATENTED IN U. S. A. AND CANADA

You Don't Need Mechanics or Maintenance Men to Keep 'em Going

And in addition, of course, you get the following and many other features:

- instant starting and stopping
- drag-free idling
- large lever ratio
- ease of engagement
- centripetal action
- full length bearings
- no exposed actuating parts

WHAT a blessing to know that at least one piece of mechanism doesn't need watching, fixing or adjusting. Install CONWAY CLUTCHES and they keep on their merry way for years and years.

Reasonable deliveries on catalog models. Write for new bulletins and details.

Gear Tooth Drive
Triple Plate
Mechanism.



THE CONWAY CLUTCH CO.

1541 Queen City Ave., CINCINNATI, OHIO

If any work-slips are never recovered, it manifests lack of efficiency. In some machine shops this trouble is ever-present. If not the foreman, then his assistant, or some workman, finds much of his time occupied searching for work-slips that the workman knows he delivered, but cannot be found. In at least one instance, a lathe hand and his assistant foreman came to blows, simply because the daily work-slips had not been properly retained.

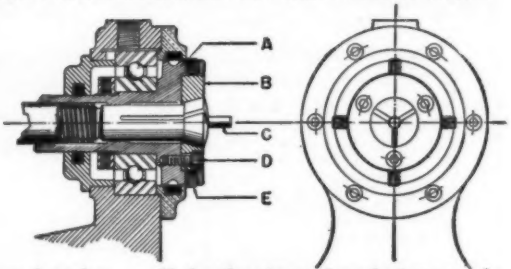
When a workman's pay-envelope contains less than he expects, by reason of lost work-slips, ensuing search, checking and adjustment entail still more time. Frequently the matter may not be traced. And the management may not be sure of the amount of work actually turned out, especially for definite days.

All this, and more, is now completely and satisfactorily solved. The management is supplying small, locked metal boxes with slots for ticket insertion. These boxes are kept on the foreman's desk, in each department, collected at the end of each shift and returned the next morning. Not even the office clerk who collects the boxes knows the actual contents. That is only for tthe one specifically assigned to the job of checking up the work-slips. The boxes being locked, only this employee can get at the contents and the boxes are opened only in the office.

The metal boxes are readily purchasable or easily made by a tinsmith.

OBTAINS NEAR-PERFECT CONCENTRICITIES IN LIGHT LATHE WORK

By replacing the regular bench lathe spindle by a "bell end" spindle and incorporating a central disk in which the taper portion of the collet seats, practically perfect concentricities are obtained in machining tiny parts for meters and instruments in manufacture at General Electric's West Lynn Works.



The changes are made without altering the effective length of the spindle or draw bar. As revealed by the drawing, "A" shows the bell end of the spindle; "B" is the disk which receives the collet "C"; "D" indicates the three screws which hold the disk fast after four screws "E" have been used as jack screws to adjust the collet to concentricity. The arrangement is adjusted easily by grasping a plug of the collet size and applying an indicator to it.

REDUCING SCRAP LOSS

In the past, the War Production Committee of the Westinghouse East Springfield, Mass., plant conservation program has concerned itself, with gathering scrap from the plant and employes homes. Now this group is turning its attention to an even more essential problem, reduction of scrap losses during manufacture.

Termed as a revival, by committee members, this activity is not entirely new, but redirects the emphasis which has shifted during recent months.

Under the stress of producing new devices for war, the emphasis has necessarily been on output. In addition, hundreds of new employes have been added, many of whom do not realize the importance of cumulative losses resulting from poor quality work, which becomes scrap.

Individual problems of various departments are considered and solutions worked out. Recommendations as to methods improvement, tool design and materials handling will all come from the committee.

Progress of the campaign will be closely followed thru records of the plant's quality control department. Records of this department will also serve to show where attention is most needed.

Cutting Tools are War Weapons of the Production Front.—Guard 'em Well!

Have you a Tough metal cleaning problem?



These engineers can help you quickly — at no cost or obligation

If you want to cut your degreasing costs and speed up your metal-cleaning work — if you have a difficult metal-cleaning job that's giving you trouble — get in touch with us *at once!* There is a lot more to solving a degreasing problem than just buying some new degreasing equipment. Our engineers travel from coast to coast working on every possible type of metal-cleaning operation. They have licked some problems that were called impossible. They are *specialists in degreasing* with many years of experience in that field. They will tackle any job — without a penny of cost or obligation to you — *and we mean just that!* Write *today* telling us what your problem is — and you will get quick action!

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ROTARY FILES
HAND CUT . . MILLED CUT
GROUND FROM THE SOLID
There is a Grobet Rotary File, Cutter, Diesinkers Bur in shape, size, and coarseness of cut for every type of hard or soft metal, plastic, wood, etc.
Send for Catalog WR illustrating the complete line in full size, speed charts, etc.
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IMPORTERS OF GROBET SWISS FILES MFRS. OF GROBET ROTARY FILES

CHAINS ELIMINATE STATIC



By hanging a number of brass chains over the arm ports of a carborundum blasting booth, discharge of static electricity between the operator's arms and the blasting enclosure is eliminated. The simple remedy was devised at General Electric's Schenectady Works.

TOOL CONSERVATION

Particularly timely in view of the Government's drive to conserve cutting tools is a 6-page bulletin GT-157 on how to reclaim carbide tipped cutters and worn out HSS cutters has been issued by Carboloy Co., Inc., 11139 E. 8-Mile Road, Detroit. Included is detailed information on procedure to be followed in the following operation.:

1—How to utilize carbide tips which have been broken or worn undersized.

2—How to remove carbide tips from steel shanks, both silver and copper soldered.

3—How to reclaim worn-out high speed steel cutters by brazing carbide tips on the cutting edges.

4—Detailed carbide tip to shank brazing procedure.

5—How to make sandwich brazes and how to braze tips to multiple point cutters.

Faster . . . Easier . . .

POWER SCRAPING with this Portable



Anderson POWER SCRAPER

The Anderson Power Scraper has a "natural hand control" . . . is as easy to use as a hand scraper. The left hand, as with a hand scraper, serves as a guide to the blade . . . the right hand controls the stroke. Pressure of the left hand controls the depth of the cut, but the forward cut requires no backbreaking labor. A slight forward pressure on the cylinder with the right hand starts the swift, smooth forward stroke which can be regulated from nothing to 3½ feet . . . 60 ft. per minute, reverse speed 90 ft. per minute. The operator can work at a steady rate without tiring as the ¼ h.p. motor does the heavy cutting. With this machine one man can do the work of several.

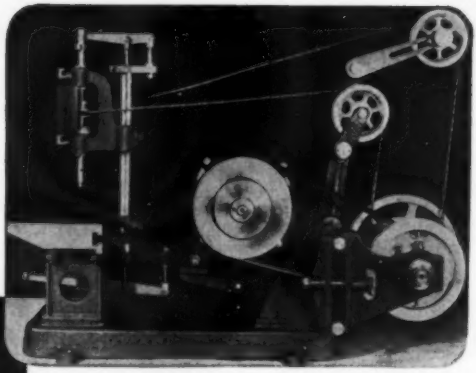
The Anderson Power Scraper, mounted on an elevating truck can be easily moved to any location. The machine may be plugged into any handy electric lamp socket and be ready for use. In the scraper housing directly across from the motor is a scraper blade grinder . . . a convenient, speedy means of resharpening scraper blades without leaving the machine.

Write for Folder giving complete details.

ANDERSON BROS. MFG. CO.

ROCKFORD **ILLINOIS, U. S. A.**

peeds from 3000 to 23,000
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FOR PERFECT HOLES FROM .004 TO 1/16" — USE A

Super sensitive

L&D HIGH SPEED DRILL PRESS

Super Sensitive is the word for it. Finger tip control, plus precision, balanced construction give perfect holes with maximum production, and a minimum of drill breakage. If you build instruments and other tools and parts requiring very small holes — if you demand the ultimate in precision tooling — if you require high production even from green help — mail the coupon today for complete details on the L & D High Speed Drill Press.

Please send me complete details on the Super Sensitive Drill Press.

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SPEED-UP WAR PRODUCTION JOBS

with this precision machine of a thousand uses

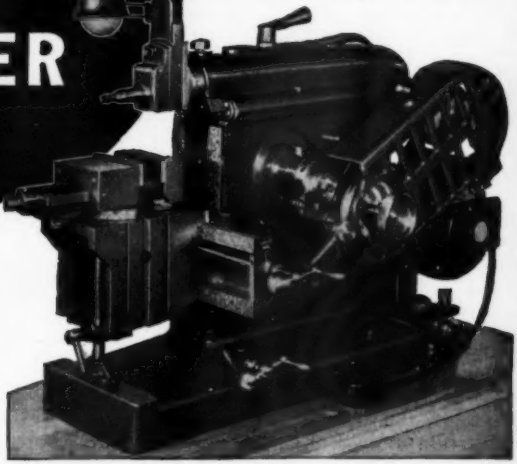
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IT'S PORTABLE

--Saves Steps and Time

AMMCO 7" SHAPER





Just wheel up to bench - - plug in - - go to work!

On jobs requiring a stroke of 7" or less, the AMMCO 7" PRECISION SHAPER will enable you to save a lot of time and expense in a set-up which would be required for larger shapers. Furthermore, the AMMCO will enable you to get away from the cost of operating a big shaper on small work.

Portable Cabinet, as shown above at left, available as optional equipment, enables this shaper to be moved about the shop. It can be rolled from one job to another, and can be brought right up to machine or bench where man is working...Write today for specifications and prices.

ARMY E NAVY

AUTOMOTIVE MAINTENANCE MACHINERY CO.
2100 Commonwealth Ave.—North Chicago, Illinois, U. S. A.

Truly Universal Tapping Machines

offer you many advantages

For tapping jobs that require unusual accuracy and a high rate of production — or for a set-up that involves a wide range of sizes, materials and shapes — this new PROCUNIER "Universal" Tapping Machine is ideal.

All adjustments can be made quickly and easily — such as regulating compensating spring pressure, setting depth stop, changing to any of the four speeds from 390 to 2050 RPM, or adjusting timing or flow of tap lubricant. Extra long compensating springs assure uniform tapping and reversing pressure *independently of operator*. Tap establishes its own lead for greater accuracy. Automatic tap lubricator provides abundant supply exactly when needed. Motor-driven continuous flow lubricant pumps also available. Has exclusive Procunier high-speed tapping head with double-cone friction clutch and TRU-GRIP tap holder which has many advantages. Many other features.



SEND FOR BULLETIN

giving full details and prices on Procunier Universal Tapping Machines, High Speed Tapping Head and Tru-Grip Tap Holder.

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For Faster, More Accurate Tapping

PROCUNIER SAFETY CHUCK CO.
14 S. Clinton St., Chicago, Ill.

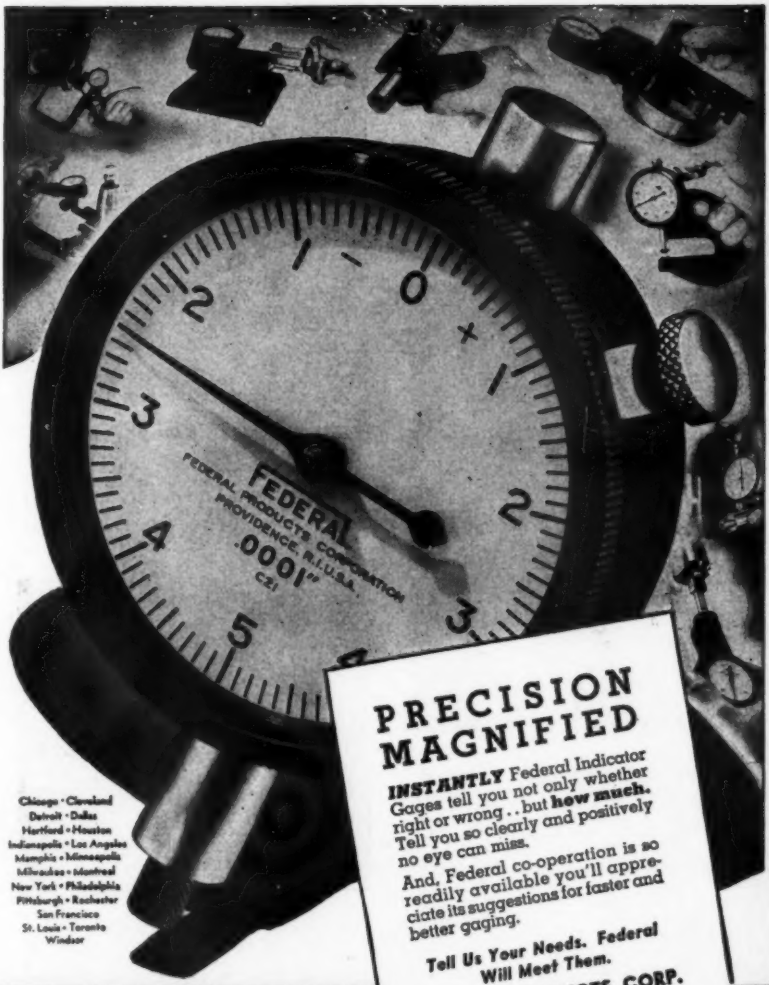
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PRECISION MEASURING INSTRUMENTS

BRAZING NONFERROUS JOINTS

Three of the four basic methods of brazing on a production basis with phos-copper, a special brazing alloy, are shown in these photographs of operations in plants of the Westinghouse Electric & Mfg. Co. These methods are:—Gas Brazing, using an oxy-acetylene torch. It is the most widely used and most flexible method of heating the parts to be brazed; Incandescent Carbon brazing which uses a minimum of brazing alloy, and Electric Furnace Brazing, which is ideally suited to heating a wide variety of parts.



INCANDESCENT CARBON BRAZING—Here the worker brazes terminals to a-c welder leads with portable welding tongs. Heat is generated in carbon electrodes and transferred to the work by conduction. Joints are heated and cooled under pressure, insuring strong joints with a minimum of brazing alloy.



GAS BRAZING—This operation involves brazing the diaphragm on a copper flange assembly for condenser bushings. With this setup, a strong leakproof joint is made with a gas torch in a few seconds.

The fourth type of brazing is accomplished by two methods:—metal bath or chemical bath. These baths may be heated by gas or electricity. In the metal bath, filler metal is obtained from a molten bath of brazing alloy. In the chemical bath, parts are brazed by pre-placing the brazing material before immersing in the heated bath. In the chemical bath, parts are jigged to hold them firmly together until the assembly has been removed from the bath and the brazing alloy has solidified.



ELECTRIC FURNACE BRAZING—Phos-copper, the special brazing alloy is replaced and upon being heated to the melting point, in the presence of a reducing protective atmosphere, is drawn into the joint by capillary action resulting in strong uniform joints. The protective atmosphere prevents oxidation during heating and cooling, and produces clean, bright joints of excellent appearance.



EX-CELL-O CYLINDER BORING MACHINE

To left: **Ex-Cell-O angular type machine equipped with six spindles to finish bore valve seats and valve guide holes in cylinder head of aircraft engine on a production basis. Each spindle is individually adjustable for depth of cut, as are the tools in the boring bars (boring bars, not shown in picture, are piloted in the fixture).**

SPECIAL MACHINES

...for today's production...and tomorrow's

For years Ex-Cell-O has been familiarly known as "the headquarters" for special single-purpose machines for turning out accurate parts at a high rate of speed . . . machines that frequently perform numerous operations in one setting of the work and often bring not only a substantial increase in the number of parts produced hourly but also improved quality and reduced unit cost. . . . This is why so many manufacturers have turned to Ex-Cell-O for equipment to meet their war production schedules; why Ex-Cell-O designed machines will figure in the post-war plans of an increasing number of American industries. . . . If you are planning for tomorrow, when the new standards will necessitate costs that are competitive, take advantage of the wide engineering experience and extensive manufacturing facilities that for many years have made Ex-Cell-O a leader in the precision machine tool field

EX-CELL-O CORPORATION • DETROIT, MICH.

EX-CELL-O SIX-WAY MACHINE

Below: Ex-Cell-O six-way machine for drilling, broaching and reaming valve guide holes in a magnesium crankcase. This machine is equipped with four standard hydraulic power units and two Ex-Cell-O special hydraulic broaching units.



XLO

EX-CELL-O *for* PRECISION

Precision **THREAD GRINDING, BORING AND LAPPING MACHINES • TOOL GRINDERS • HYDRAULIC POWER UNITS • GRINDING SPINDLES • BROACHES • CONTINENTAL CUTTING TOOLS • DRILL JIG BUSHINGS • DIESEL FUEL INJECTION EQUIPMENT PURE-PAK CONTAINER MACHINES • R. R. PINS AND BUSHINGS • PRECISION PARTS**

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SWISS TYPE

GEAR HOBBERS

... for Accuracy and speed in hobbing PINIONS GEARS and SECTORS



TWO MODELS

No. 00 SPUR GEAR HOBBER (illustrated) for work up to 2" diam.

No. 1 SPUR and SPIRAL GEAR HOBBER for work up to 6" diam.

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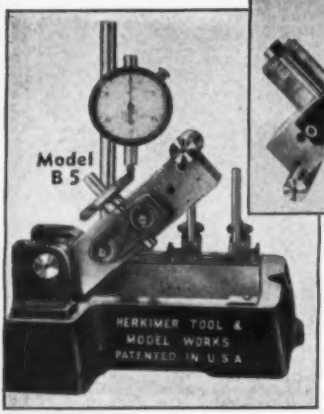
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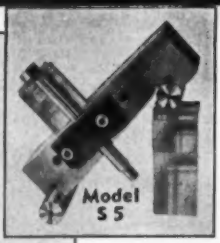
The Hamilton Tool Co. Hamilton, Ohio



BRAZING WITH SPOT WELDER— An interesting use of the brazing process is shown here where it supplements regular spot welding procedures to facilitate production.

Simplified BEVEL GEAR GAUGING





No Difficult Operations, Involved Calculations or Intricate Manipulations.

With one set-up on these tools, any operator with ordinary gauging experience and a knowledge of blue print reading, can perform these three important operations:

1. **Check dimensional accuracy of the addendum cone (gear face) as related to thrust face of hub.**
2. **Check accuracy of cone angle.**
3. **Check run-out of gear face.**

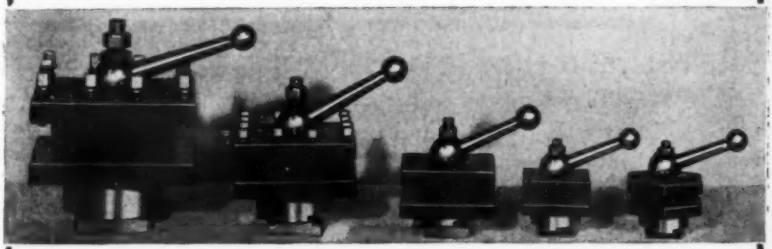
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BUILT-IN ACCURACY

WITH

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"ENCO" Turret Tool Posts

ENCO Turret Tool Posts are easily operated and easily maintained. Mount rigidly in T-slot of compound. Indexing is easy and positive and turret keeps setting accurately. Numerous users of our turret tool posts are holding limits of .001 plus or minus, without the use of micrometers. 12 position indexing enables the compound to be set at any angle. Carburized hardened steel construction. When ordering, specify make of lathe, swing and maximum tool size used.

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Model H—Six tool 12 position 3" hexagon Takes up to ⅜" tool.....$25.00

Model 3½-S—Four tool 12 position 3½" square. Takes up to ½" tool.....$35.00

Model 4-S—Four tool 12 position 4" square Takes up to ⅝" or ¾" tool.....$49.50

Model 6-S—Four tool 12 position 6" square Takes up to 1" or 1¼" tool or 1⅜" tool holder for ⅜" bit.....$99.00

"ENCO" Tailstock Turrets

The ENCO Tailstock Turret increases the normal tool capacity of your lathe six times. Its positive indexing mechanism—tapered and hardened — means accurate centering of all tools each time they are indexed for use. In the ENCO your tools are mounted in tool holes bored to close limits after assembly.

Model A—2½" dia. with No. 1 or No. 2 Morse Taper arbor and six bored ⅝" tool holes $18.95

Model B—5" dia. with No. 2 or No. 3 Morse Taper Arbor and 6 bored ⅞" holes; or with No. 4 Morse Taper arbor and 6 bored 1" tool holes.....$32.95

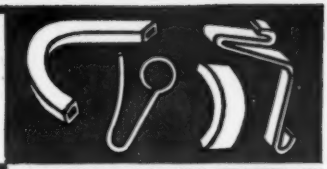
Model B-1—5" dia. with 1" straight shank and 6 bored 1" tool holes for use on Turret Lathes $37.95

ORDER FROM ENCO DEALER OR WRITE TO US FOR NAME OF NEAREST ENCO DEALERS

ENCO MANUFACTURING CO.

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IF YOU BEND tubing, wire, channel, moulding, strip stock



OR FORM angles, channels, "vees", brackets, clips



OR TRIM stampings, strips or squares, make slits or notches



Investigate the DI-ACRO System of DIE-LESS DUPLICATING

Do you need metal stampings or duplicated parts in a hurry? Quite probably you can make them without dies! DI-ACRO Precision Machines — Shears, Brakes, Benders — have a remarkably wide range of applications especially when two or more units are used in combination. In many cases they eliminate the need for dies entirely — and you have your stampings or parts in a few hours. All duplicated work accurate to .001". Put "DIE-LESS DUPLICATING" to work in your plant — it will solve many a knotty problem.



DI-ACRO BENDERS

Bend angle, channel, rod tubing, wire, moulding, strip stock, etc. 3 sizes. Capacity—up to ¼" cold rolled steel bar.



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Form non-stock angles, channels or "Vees." Right or left hand operation. 3 sizes. Folding widths, 6", 12", 18".



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Square and size material, cut strips, make slits or notches, trim duplicated stampings. 3 sizes. Shearing widths, 6", 9", 12".

Send for Catalog "METAL DUPLICATING WITHOUT DIES"

It shows many typical stampings or parts made with the DI-ACRO System and describes how you can readily convert these STANDARDIZED units into highly SPECIALIZED machines for your own work.



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You get accurate, dependable results and SAVE A LOT OF MONEY —with the Delta Carbide Tool Grinder



This low-cost grinder runs absolutely true, free from vibration, for fine grinding of carbide tipped tools

Manufactured by modern precision methods in a modern plant, this sturdy, vibrationless Delta Carbide Tool Grinder is so well-built, so accurately machined that you can depend on especially fine results.

It is so low in cost that it can be used profitably in *any* shop — large or small. Combined with the Delta standard tool grinder for hogging down the shank steel, it gives you a perfect working combination for sharpening tungsten carbide tools, with a remarkably small initial investment. Many outstanding features to assure accuracy and long life.

Widely used in war plants, this good-looking, modern machine has made a record for itself wherever it has been installed. Get credit for discovering the low-cost Delta way in *your* plant. Investigate! Send for the new Delta catalog giving full details.

M-2C

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What's New in Metalworking

BARNES, 445, 2-SPINDLE DEEP HOLE CYLINDER BORER

EXTENSIVE acceptance among aircraft makers, for boring large landing-gear struts and recoil cylinders, is claimed for a newly-announced development, similar to the Barnes, 445 Deep Hole Drilling and Boring Machine.

It bores two parts at once in completely independent cycles, each workpiece being driven by independent headstocks and supported by separate, adjustable, 3-point roller steady-rests, Timken Bearing equipped, with screw adjustment of from 5" minimum to 16" max.

Tools are fed by independent hydro-actuated slides. Heads are fitted with spindles having 6¼" hole and 15" American Standard lathe spindle nose, to suit 21-24", 4-jaw independent chucks or 21-24", 3-jaw scroll chucks. Rough V-locator, hand-actuated, incorporated into steady-rests, provides support for workpiece when loading. It has hinged top portion to facilitate handling the part.

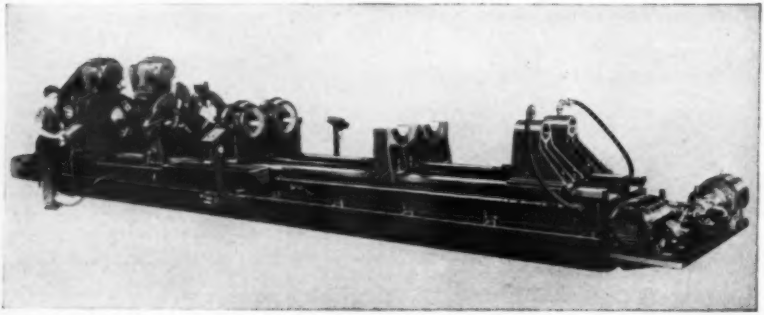
Toolholders are bored for 6" diam. bar. Bar supports, positioned midway between toolholders and guide-bushing brackets, remain stationary until tool holders have been fed forward to meet them, after which supports are carried along the ways until cycle is completed. When toolholders are traversed to starting position, bar supports are also returned by latch on toolholders, controlled by dogs clamped to center way.

Two motor-driven hydro-feed and traverse units at head end of machine actuate hydro-feed cylinders in base. Spindles and hydro-feeds are completely controlled from two button stations on corresponding sides of machine. Spindles and hydro-units may be stopped from any one of four control stations. Each spindle has independent motor-driven, high-pressure coolant pump.

Bulletins, available from W. F. & John Barnes Co., Rockford, Ill., the manufacturers, give complete specifications.

COLD SAWING

Heavier feeds that shorten operations, improved accuracy, reduction of frictional heat, and prolonged blade-life are attributed to segmented cold-saw blades as developed by Motch & Merryweather Machinery Co., 715 Penton Bldg., Cleveland.



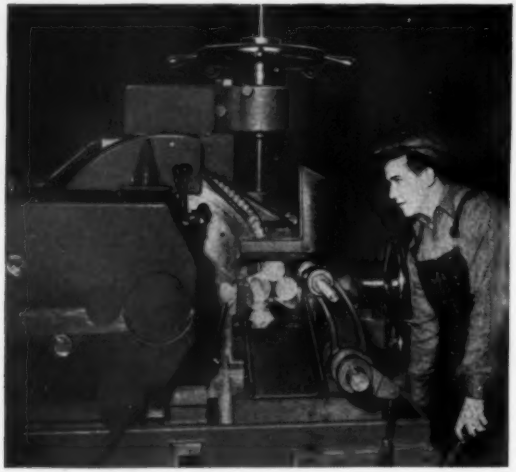


Sheldon BBU-1240 WQ
Precision Lathe

This quality 12 in. ball bearing tool room lathe is built for precision work and will retain its accuracy under long and hard usage. It has extra collet capacity (to 1" round), the finest precision ball or roller bearings obtainable, an improved heavy-duty, double wall apron with power cross feed; full quick change gears and full bowl headstock. Its improved Sheldon 4-speed, V-belt, lever-clutch operated, underneath motor drive is entirely enclosed in the pedestal leg and has anti-friction bearings. It is so designed that spindle belts operate thru a *standard* 1-piece bed. This bed is bridge-braced with heavy cross girts and has hand scraped ways—2 V-ways and 2 flat ways.

If interested in 10", 11" and 12" quality lathes be sure to see the SHELDON.

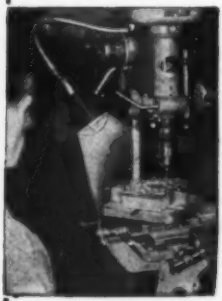
SHELDON MACHINE CO., INC.
4242 N. KNOX AVE. CHICAGO 41, U. S. A.



Segmental-Blade Cold Sawing claims unusual speed, accuracy and economy under today's round-the-clock production schedules.

Blades consist of a circular body upon which a specific number of high-speed steel segments are mounted. Disc is made of special alloy steel, hardened and machined to close tolerance for square cutting. Segments are fitted accurately to disc and to each other, forming a closed ring. Unusual rigidity of blade is imparted, it is said, because segment in cut is always strengthened by all other segments around the periphery. In addition, a riveting arrangement enforces initial firmness.

The LIGHT That "Gets Around the Corners"



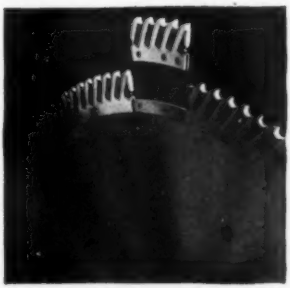
Fluorescent lighting with all its advantages, doesn't always provide the close-up, exactly focused illumination so often needed for precision work. VIMCO-LIGHT directs a concentration of light . . . glareless, clear, restful . . . **where the operator needs it** for fast, error-proof production.

Write for circular.

VIMCOLIGHT

VIMCO MANUFACTURING CO.

109 CHENANGO ST. BUFFALO, N. Y.



Segments in saw-blade form a closed ring, serving, also, to reinforce the disc.

Each two teeth form a cutting cycle. Ground alternately high and low, the first and higher makes a roof-shaped roughing cut. Corners on these teeth are

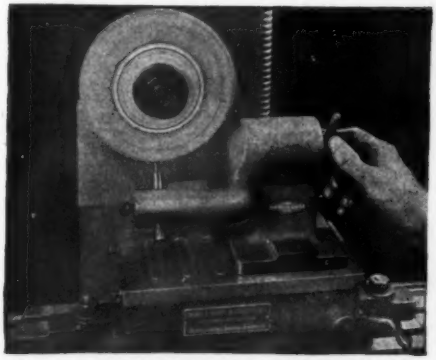
GRINDING WHEELS DRESSED

quickly, accurately with UNIVERSAL Radius Dresser



Note the ease of setting up the radius dresser by use of gage blocks. Z-shaped set-up block is clamped to swivel arm and removed after diamond has been set for correct radius.

You can do a better job by grinding the radii of your tools, dies and gages with grinding wheels dressed to gage-block accuracy. The American Radius Dresser is a sturdy, compact, precision-built unit that is easily, quickly set. It will clear 7½" grinding wheel and dress convex or concave radii up to 1 inch.



Base of radius dresser is machined parallel to center line of swivel arm to set against straight edge of magnetic chuck. Not necessary to remove wheel guard. Swivel arm operated by hand wheel in safe, convenient position.

Swivel arm pivots on hardened and ground steel shaft with large thrust surfaces at ends. Dust-proof bearings; constant lubrication.

Send for Bulletin 43-BB, including details on the time-saving American Amplifying Gages, Thread Checkers, Hole Checkers, Bench Centers and Lapping Plates.

THE AMERICAN GAUGE CO.
125 Bayard Street **DAYTON, OHIO**

GIRLS CAN OPERATE

NEW Rouse
HAND MILLER
FOR SMALL PARTS

$98
(Without Fixtures)
F. O. B. Chicago
Motor Extra



One of the ROUSE Fixture Set-Ups that Speed Production

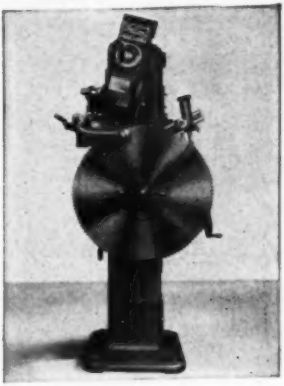
The Rouse Hand Miller is a versatile, efficient, high-speed ball bearing machine for handling light cuts in brass, aluminum and steel.

Rouse Fixture Set-Ups make the Rouse Hand Miller readily adaptable for accurately milling small parts for planes, radios, electric motors, and similar equipment. Spindle will take milling cutters or end mills.

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bevelled at 45°, taking out center of the cut. Intermediate, lower teeth take the second or finishing cut. Being full-width and but slightly lower than teeth preceding, they remove corners remaining from the first cut.



Specially-designed automatic saw-grinder for imparting correct contour to saw teeth.

Chips are broken and load distributed, say the makers, one wide and two narrow chips resulting. Division of work between the two distinct cutters is said materially to advance blade-life as well as afford the cold-sawing advantages attributed to the method.

It is claimed to offer superiorities in cutting of NEA Steels, the firm having available a special cooperative service department, to render counsel in such operations, where desired.

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A new line of special industrial work illuminators, magnifying and inspection units, is said to expedite and facilitate difficult operations on small parts and inaccessible locations.

The work illuminators comprise many different types of highly specialized electric lamps, designed to meet the peculiar requirements of localized industrial illumination.

Complete information and illustrated literature may be obtained by addressing the Acro Tool & Die Works, Dept. X, 534 North Kedzie St., Chicago, Ill.

THE ABRASIVE INTERNAL GRINDER No. IG



Available for Immediate Delivery

Originally designed for high production work grinding cartridge dies and similar small parts, the Abrasive Internal Grinder No. IG offers unusual flexibility and handles a wide variety of production and toolroom grinding jobs. Heavier in weight than most bench-type grinders, the No. IG is exceptionally rugged and accurate. Work spindle, of machine tool construction, mounted on super-precision ball bearings, is carefully sealed against abrasive grit. Diamond wheel dresser assures accuracy of hole size.

Write for descriptive literature illustrating the unusual versatility and range of this machine.

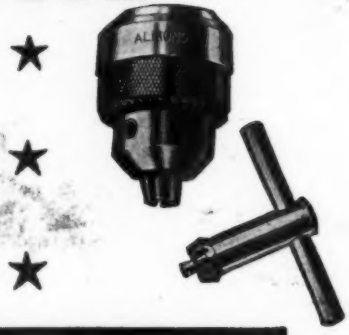
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Manufacturers

Since 1872

The ALMOND Three - Jaw Drill Chucks were the first to be placed on the market. They were the Pioneers in the field of Drill Chucks. Are widely used for holding drills, taps, reamers and other tools, and are always used in connection with and by being mounted upon some form of machine tool, such as drill press, lathe, or milling machine, also on portable tools, principally electric and pneumatic drills.



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T. R. ALMOND COMPANY

ASHBURNHAM, MASS., U. S. A.

"Almost human"

. . . that's what many users say about the

Ettco-Emrick

FOOT-OPERATED

TAPPING MACHINE



And they say it because this machine does fast, accurate tapping almost automatically. All it needs is someone to feed the work and step on the foot pedal.

The skill ordinarily required in tapping is supplied by the exclusive Ettco-Emrick Tapping Head with its high speed, hair-trigger sensitive central friction clutch and automatic reverse, and the sensitively counterbalanced foot pedal and drive mechanism.

That's why inexperienced operators—men or women—can maintain a production of **2400 accurately tapped holes per hour** with the standard 2-spindle Head — and up to 12,000 per hour with available Ettco-Emrick Multiple Spindle Tapping Heads.

WRITE FOR BULLETINS

Bulletin No. 4 *gives details of the Tapping Machine.*

Bulletin No. 3 *tells all about the Multiple Heads.*

A 2-spindle Head is standard equipment on the Tapping Machine

ETTCO TOOL CO.

596 Johnson Ave., Brooklyn 6, N. Y.

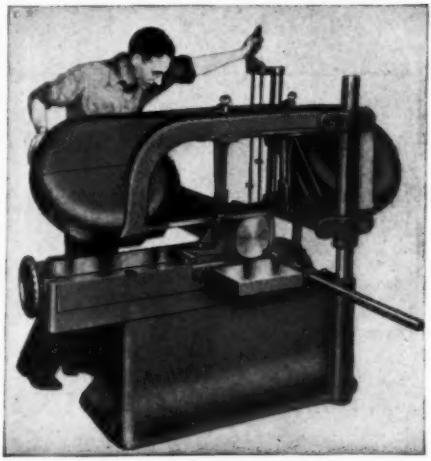
DETROIT • CHICAGO

25 YEARS OF SPECIALIZATION IN MACHINE TAPPING EQUIPMENT

Large Size Band Saw Introduced by Wells

With a capacity of 13 x 16" rectangular and 13" in diameter, round, the recently introduced Wells Metal Cutting Band Saw, Model V-12, is designed to extend the advantages of continuous metal cutting to many larger jobs that previously could not be handled on a low cost band saw. The V-12 is said to incorporate the best features of the well-known Wells Models No. 5 and No. 8, and in addition offers a new hydraulically controlled feed and lift apparatus as well as several other developments.

The most radical departure from the Nos. 5 and 8 saws is in appearance. To provide the necessary ruggedness for the increased capacity, the frame has been completely redesigned. The appearance is quite pleasing and gives the impression of rugged strength.



CRITERION *Diamond* TOOLS



For

STEADY PRODUCTION

Dependable diamond tools are vital in present production schedules. Every day more users are turning to Criterion Diamond Tools for the kind of service which they must have. Quality of diamonds used plus a unique method of setting assures extreme rigidity and extra tool life. Special tools made to order following blueprints or specifications. Sharp-pointed, selected thread grinding tools. Order direct. Request literature.

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MACHINE WORKS
BEVERLY HILLS, CALIFORNIA

Gusher
COOLANT PUMPS

Write for descriptive literature

Made in various types and sizes from 1/30 to 2 H.P. Pumping capacity up to 200 g. p. m. Many patented and exclusive features.

THE RUTHMAN MACHINERY CO.
1808 Reading Rd. Cincinnati, Ohio

NEW LOW COST
DRILL GRINDER

Anyone can do *expert* drill grinding with this simple-to-use drill grinding attachment—fits on any bench grinder—saves buying new twist drills—saves time and materials that dull bits waste. Grinds bits from 3/16 to 1¼. Write for FREE literature.



T & H MFG. CO.
811 E. 31 St.
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....finer and faster!

Geared to high speed and fast action, America's new tank-busters rip into the enemy's crack tank columns, smashing their most powerful tanks and putting them to rout. Not once, but many times during the past few months has this happened. These tank-busters depend vitally upon accurately made gears for their speed and performance. Such gears can be accurate only when checked against precision-built master gears.

VINCO Master Gears are carefully controlled through all stages of manufacture from design to final inspection. They represent the ultimate in the art of precision manufacture of spur, helical and worm gears.

VINCO's long experience in precision is at your service in the solution of your war or post-war production problems.

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TAPS

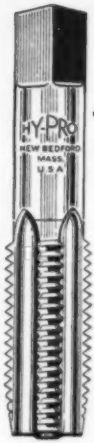
High Speed Steel Hand & Machine Screw Taps

Cut Thread; Commercial and Precision Ground Thread Taps, Special Taps.

Clean, Sharp Threads for High Production

Write for Catalog on company letterhead

- BUY MORE BONDS -



HY-PRO TOOL CO.

481 Mt. Pleasant Street, New Bedford, Mass.

The

"HOUSE OF PRECISION"

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Jansson Gage Blocks—a good standard for precision measurement. Used by leading armaments manufacturers. Preferred by experienced inspectors for their extreme accuracy.

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JANSSON GAGE COMPANY

DETROIT • MICHIGAN

Write for Literature and Prices

19220 Glendale Ave.

The V-12 is equipped with a ¾ hp electric motor which drives the blade at a choice of three speeds, 53, 94 or 148 feet per minute. Taking advantage of this choice of speeds, it is possible to cut almost any metal in almost any shape.

In size, the V-12 is 52½" in over-all height and requires a floor space of 73 by 30". Top of the bed measures 24" from floor. Weight of the saw is 1750 lbs. Other details of the saw include a hand-operated quick-acting vise, belt and gear drive and ball bearing support of moving parts. Address Wells Mfg. Co., Three Rivers, Mich., for further information.

SAFETY SLEEVE HOLDER

The M. E. Cunningham Co., 228 E. Carson St., Pittsburgh, Pa., is marketing a Safety Sleeve Holder designed to assure a clear, even impression in marking on small, round and square pieces.

It is said to be especially adaptable for marking gun barrels, small tubes and also for numbering stock in warehouses or stock rooms. A sturdy outside frame is made from alloy steel to insure long service and legs of the frame are grooved for use on small rounds.

The top selection, surrounding shank of type holder, is knurled for positive grip, and a special pin, easily removed for quick change of steel type inserts, secures holder in place. Type holder is made of Cunningham's special "Safety" Steel, claimed to give exceptional service with the safety features of non-spalling and non-mushrooming. Can be made with any size or number of characters.

CLAMPING CATALOG

Listing full Knu-Vise line of vertical handle, adjustable base and cam-action toggle clamps, as well as pliers, c-clamps, vise grips and vises, this catalog is among the most comprehensive published. Featured is the fact that they are pre-set for the pressures required. Pressure spindles then remain unchanged for the run of the job.

The firm states it can cite many cases in which use of its products replaced expensive equipment aimed to hold parts together, and offers the catalog to afford a comprehensive picture of its line as well as available treatment of clamping problems, regular or special, encountered in production.

Address Knu-Vise, Inc., 1334 Plum St., Detroit.

Special LIVE CENTER SET-UP REDUCES SCRAP on vital aircraft engine part



Battery of Ex-Cell-O Thread Grinders Involved in Operation.



Operator at N. A. Woodworth Company, Ferndale, Michigan, putting another part on specially designed Sturdimatic Live Center.

They had trouble with **dead centers,** during a precision grinding operation at N. A. Woodworth Co., because of deep scratching. Emery, in the coolant, was getting between dead centers and a highly polished spherical radius hole, in the part, that was used for support between centers. . . . We designed a special STURDIMATIC LIVE CENTER which, revolving with the part, stopped all movement between the highly polished concentric surface and the center, eliminating the trouble at the source — without any rubbing action, the emery in the coolant had no bad effect. . . Scrap had been running high — threads had to be ground concentric with the spherical radius hole within very close tolerances and production of thousands per day had to be maintained. So here a substantial saving on a vital war part was accomplished by using a STURDIMATIC LIVE CENTER. . . . ***standard shanks with Morse taper carried in stock . . . send for catalog.***

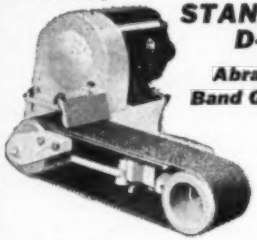
STURDIMATIC TOOL COMPANY
5224 THIRD AVE., DETROIT, MICH.
LIVE CENTERS



'STEP-UP' GRINDING SPEED

DUPLEX M-6
BAND AND DISC GRINDER

The latest in pedestal type grinders. Actually two machines in one! 14" disc for all rough work . . . 6 x 48" band for finishing. Precision-built to meet war-time production standards—quickly, economically!



STANDARD D-4
Abrasive Band Grinder

This new, streamlined bench type grinder assures fast, quality finishing on metals, plastics, wood, fibre . . . at low cost. Built to machine tool specifications, Standard D-4 is equipped with improved band tension control and specially designed protective motor hood. 4 x 36¼" band. The ideal portable unit.

OTHER STYLES AND SIZES IN NEW BOOKLET ON FINISHING—WRITE TODAY

WALLS SALES CORP.
96 Warren St., New York, N. Y.

REEVES OFFERS NEW UNIT



A new unit in the line of variable speed control equipment built by Reeves Pulley Co., Columbus, Ind., is the Reeves Reducer-Type Transmission.

This drive, which consists of the standard Reeves Variable Speed Transmission with built-in Speed Reducer, has been developed to meet the many requirements for accurate speed control and speed reduction combined in one compact completely enclosed unit. An outstanding advantage of this Reeves drive is that far less mounting space is needed to obtain the lower range of speeds which formerly required use of auxiliary speed reducing equipment.

The Reeves Reducer-Type Transmission is available in two enclosed designs—horizontal and vertical, which may be mounted in any convenient or desired position. Each design is available in a wide range of speeds and in capacities from 1 to 7½ hp inclusive. The Transmission in various sizes provides ratios of speed variation from 2:1 through 12:1 and the reduction gears provide ratios up to and including 6.9:1. Speed changes are effected by turning a handwheel or, if completely automatic regulation is desired, it is available by mechanical or hydraulic methods.

The reduction gears are mounted on the variable shaft of the Transmission, this

You can get BARCO SURFACE PLATES in a hurry—*Now*



MACHINE SHOP. With a Barco Surface Plate next to his machine, the operator can quickly check the accuracy of his work, correcting any error.

. . . and they're more than worth the difference

Barco Surface Plates are made of Meehanite; eliminate cast iron's disadvantages. You get uniform strength and solidity; no shrinkage or porosity; no crystal weakness or strain; great rigidity; no galling or seizing; resistance to heat and corrosion. Hand-scraped to close tolerances; heat-treated for better structure. Barco's octagon ribbing adds rigidity. Extra top thickness permits replaning and re-scraping; 30% to 100% heavier than ordinary plates. Barcos insure faster, more accurate measurements and increased output. Users reorder again and again, considering Barco Surface Plates *more than worth the difference . . . Complete stocks, rapid-fire shipments. Try us.*



INSPECTION. Barco Surface Plates are an indispensable aid. With them you can check a variety of dimensional requirements quickly and accurately.

ALSO—Prompt shipments on Barco Slotted Angle Irons and Straight Edges. Meehanite, hand-scraped, heat-treated, speeding accurate measurements and dependable work.

Ask for our Bulletin "B-8"



COMPARITOR. With gauges properly mounted, the Barco Surface Plate becomes a comparitor. Thousands of parts checked with minimum effort.

BARCO SCRAPING COMPANY
1975 East 65th St. CLEVELAND, OHIO

BARCO MEEHANITE SURFACE PLATES

MORE THAN WORTH THE DIFFERENCE

shaft serving as the input shaft for the reducer unit. Assembly of the reducer unit may be made in many different positions.

The gear reduction unit, which is built integral with the transmission, has been especially developed for the severe torque demands of variable speed service. It is the same unit in single reduction type that has proved itself in thousands of applications of another basic Reeves drive, the Vari-Speed Motodrive. Designed for as compact mounting as possible, allowance has been made in size for overload in starting and momentary peak loads. Shafts of the reducer, proper, are mounted on heavy duty ball radial bearings and are manufactured from high carbon steel.

The helical type of gear reducer has been adopted because of established high efficiency and quiet operation. Since the teeth of a helical gear are cut at an angle to the axis, two or more teeth are in contact across the face of the gear at all times, this providing smoother transmission of gear load from one tooth to the next, producing better load distribution and improving the wearing properties of the gear. All rotating parts in the reducer are splash lubricated. Three oil plugs are provided, one for determining the oil level, one for filling and one for draining the oil.

The Reeves Reducer-Type Transmission in either horizontal or vertical design may be equipped for individual motor drive by use of a Reeves motor base. The motor mounting is directly above the transmission, the motor base being attached to the top of the transmission frame. This base is universally adjustable to accommodate any standard make of motor of the correct horsepower capacities for any given size of Reeves Reducer-Type Transmission. Connection between motor and constant speed shaft of the Reeves drive may be either silent or roller chain and sprockets, multiple V-belts or pinion and gear.

A combination of our armed forces and our "fighting dollars" can't be beat.



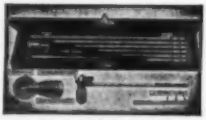
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Taps guided by precision leads. Class 3 & 4 specifications easily met. 4 speeds. Ball bearings throughout. Available as floor model (with coolant system) or table model.

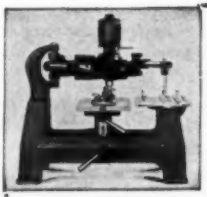
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Highest accuracy and finest workmanship. Available 1½"—6" & 1½"—12" sets.



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Machine parts and tools, heat-treated or annealed . . . on flat, concave, or convex surfaces.

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For applications where electric marking cannot be used.

A separate head for each.

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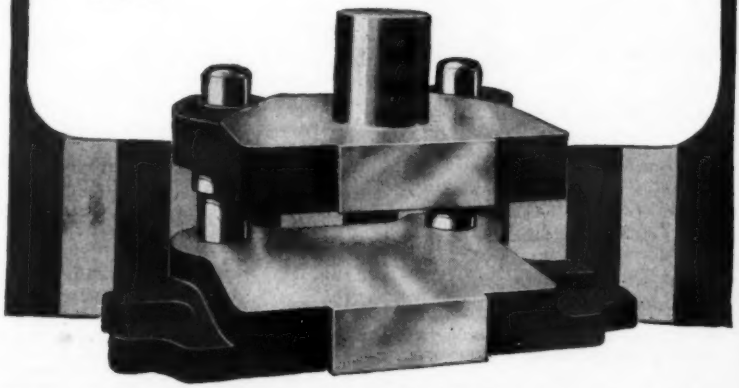
H. P. PREIS ENGRAVING MACHINE CO.
157A Summit St. Newark, New Jersey

PRODUCTO
DIE SETS

To help speed up production of tools for war production in all parts of the Country, Producto Die Sets are available for shipment from our two factories mentioned below. Also, Die Supply Company, 4747 Hough Avenue, Cleveland, Ohio.

Pacific Coast users will find stock of Die Sets and Accessories at Jamison Steel Corporation, San Francisco and Los Angeles.

Our No. 9 Die Set Catalog gives complete engineering information on Die Sets and Die Makers' Accessories.

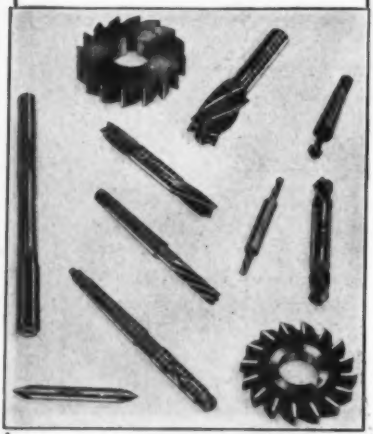


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Prompt Delivery on Special Tools, Dies, Jigs and Fixtures Made to Your Exacting Requirements.

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Write for prices on standard sizes or submit blueprints for special sizes.

Galter Manufacturing Co.
711 W. Lake Street - Chicago, Ill.



The Ohio Crankshaft Co., Cleveland, has recently launched a distinctive new-worker training course that "pays-as-it-trains" and provides a combination of shop and classroom instruction differing in basic aspects from similar programs. The new course is designed to meet the coming problem of fitting an approximate 2000 new workers, many from non-essential industries, into machine shop positions at Ohio Crankshaft.

Each new worker goes on a two week training schedule calling for a daily six hours actual shop work supervised by competent operators, and two hours of classroom study. Employment is not dependent upon completion of the training course for trainees start in as regular workers at regular rates.

Devised by Walter T. Lehman, Training Director, the new program is geared to give instruction to a maximum number of new employees weekly. Classes meet



The GLENNY
Adjustable-Expansion
BROACH

Produces low cost, accurate keyways. Eliminates set-up time. Self aligning. Interchangeable parts. Adapted for arbor press, mechanical or hydraulic pressure. Speeds up production. Cutter bars in carbon or high speed steel. *Details? Write!*

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You Can Drive Your Machines Harder If You Give Them The RIGHT DRIVE



● Don't assume you are getting maximum production from your machine tools — new or old — if you are still using power-wasting, hazardous and shop cluttering countershaft belt drives. All over America, machine tools are turning out more work regardless of their age — taking deeper cuts at higher speeds — because they have been equipped with modern, close-connected Berkeley unit drives. By all means, **know why.** And let us also explain how the Berkeley welded steel bracket, individually engineered for each installation, makes it so easy for your own men to install a Berkeley . . . no extra gadgets required. These facts are vital today — ask for them by mail or wire.

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(Formerly located at Corry, Pa.)

New Plant and Office:
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Danville, Ill.

THE DRIVE TO GREATER PRODUCTION

around the clock, 3 per shift, 9 per day. Newcomers having some shop experience or possessing high aptitude can complete the course in less time than the prescribed 12-day period. Classes meet six times a week. Outstanding trainees are pointed out to supervision and an effort is made to give them a type of work commensurate with their ability.

Study work includes reading of blue prints, use of precision instruments, inspection technique, machine and shop nomenclature, gages and general shop procedure. About 25 worker students, both men and women, are enrolled in each class. The mixed classes have proved highly successful.

Estimates point to a possible loss to the armed forces of an additional 1000 male workers through selective service. By War's end, 50 percent of the Crankshaft personnel is expected to be women. Approximately 4000 workers are now employed.

In the illustration, Mr. Lehman is shown giving pointers to two new workers—a housewife and a former sausage salesman.



KIPP *air* GRINDER

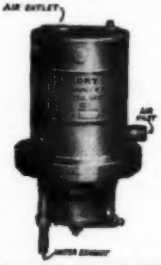
Madison-Kipp tool-makers originated the first really high speed grinder. They know a great deal about the practical side of grinder design and grinder usage. They think the new Model H is the best all around off-hand tool they have ever tried and we are sure you will agree with them. If you are doing priority work . . .

ONLY $29.75 MODEL H

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Sizes ½' to 4' Pipe

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NEED WORK-BENCHES OR WOOD STOOLS?

. . . here's a ready answer

HALLOWELL

SHOP EQUIPMENT



Fig. 928.
Pat'd and Pats. Pending. Drawer is extra

WORK-BENCHES

Are sturdy, economical. Stand firm, without costly bolting to floor. Choose from 5 heights, seven lengths, various widths — available in over 1300 ready-made interchangeable combinations. Deliveries better than average. Send for free Work-Bench Bulletin today!



Fig. 1927

WOOD STOOLS

Wartime products of the makers of famous "Hallowell" Steel Stools — now, out for the duration. Five heights; from 18 to 30 inches. With or without backs having 3" vertical adjustments. Wood Stool Bulletin will be mailed free on your request.

DURATION TYPE "HALLOWELL" WORK-BENCHES of sturdy, selected wood are available for use where steel shop equipment is prohibited by wartime restrictions. Write for Bulletin 577 showing full selection.

STANDARD PRESSED STEEL CO.

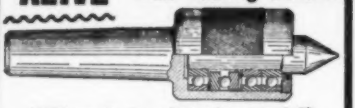
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"ALIVE" Ball Bearing Centers

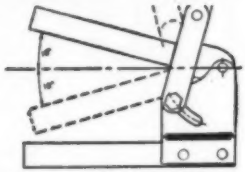


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INFINITE POSITION WITH PEC EXTENDED BASE TOGGLE CLAMPS

No other clamp is as flexible in its application —in closed position, the clamping bar has infinite adjustment up to 15° below and above horizontal. Drop forged construction. Write for new 28-page catalog (on your firm letterhead, please).

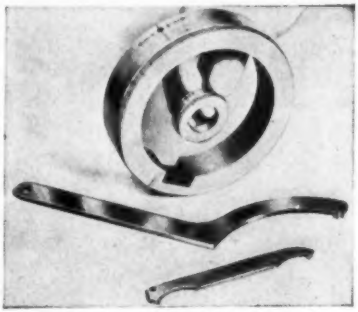
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ADJUSTABLE SPACING COLLARS

Where necessary to use milling machine cutter arbor shims, these adjustable micrometer spacing collars in sizes from 7/8" to 5½", not only eliminate them, but give required positive adjustment for spacing of straddle mills without removing cutters or collars from the milling machine cutter arbor.



A special pin spanner wrench is furnished with each size, making it possible quickly to adjust spacing collars as to plus or minus dimensions, required in connection with direction indicator engraved on the outer sleeve.

Each collar is furnished complete by the Dayton Rogers Mfg. Co., 2835 12th Ave. S., Minneapolis, including spanner wrench and hinge covered case for the desired size collar.

PLAN-O-MILL ISSUES CATALOGS

Available without charge to titled production executives inquiring on company letterhead, are two new planetary milling catalogs issued by the Plan-O-Mill Corp., 1511 E. 8-Mile Road, Hazel Park, Mich.:—

OPEN THE WAY TO GREATER PROFITS

BY USING S & S HINGES

BUTTS AND CONTINUOUS LENGTHS — for GUARDS — CABINETS — CASES — BOXES — LUGGAGE

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HEAVY DUTY BACK-GEARED MILLING MACHINE

Timken Spindle Bearings

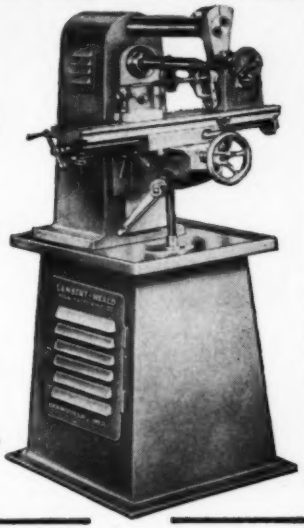
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17" Longitudinal Travel with Power Feed
16 Spindle Speeds — 8 Thru Back Gears

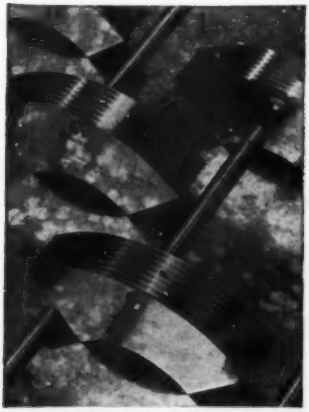
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ALSO 8" FULL-TILTING TYPE DIVIDING HEADS
For IMMEDIATE DELIVERY.

Write for Literature



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SPECIAL OR STANDARD GAGES OF ALL TYPES

These special segment thread gages are examples of the wide variety of thread, plug, and ring gages being regularly produced in our plant. Designed by our staff of engineers and manufactured to specified tolerances, they represent the highest skill and craftsmanship. The same high standards apply to special tools, fixtures, machines and parts, produced singly or in volume on contract. Our facilities and equipment are equal to the finest in the country. Write for literature describing these special engineering and manufacturing services, and our line of standard gages, carried in stock for prompt shipment.

MERZ *Engineering Company*
INDIANAPOLIS 7, INDIANA



(1) 14 pages on the Number 3 Plan-O-Mill for cylindrical parts up to 8" work diameter; (2) 18 pages on the Number 5 Plan-O-Mill for larger parts.

Each catalog is in two colors, of standard 8½x11" size, with large double-spread machine illustration and tabled features and specifications. The principle of Planetary milling is fully explained and graphically illustrated, together with actual case histories of Plan-O-Mill form and thread milling in war production. Major Plan-O-Mill features are pictured and described. Inquiries should specify maximum diameter of work to be milled.

CLARK SURFACE FACER



A surface facing tool to take the place of standard end mills for surface facing, is announced by Robert H. Clark Company, 3424 Sunset Boul., Los Angeles. As shown, it consists of tapered (or straight) shank and body with 3 adjustable high speed bits which may be set for any diameter within range of the tool. With only 4 tools any diameter from 1" to 4½" inclusive may be obtained without being limited to standard fractional dimensions. A measuring gage is provided with each tool for quick, accurate size adjustments. Bits can easily be reground or replaced at comparatively small cost, lengthening the life of the tool indefinitely.

Each of the 4 tools covers the range of

GLOBE MILLER

Quickly earns its cost!

MAKES A MILLING MACHINE OUT OF YOUR LATHE IN 3 MINUTES

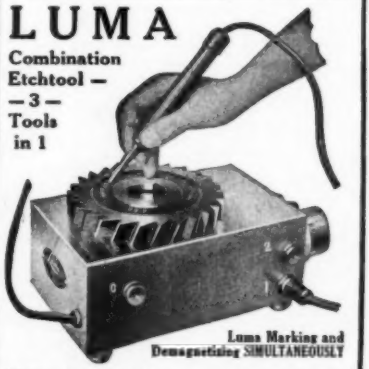


Attaches to your lathe, does same precision work as a costly milling machine. Increases swing of lathe 5 to 10 inches, depending on lathe size. Complete line of accessories available, such as Dividing Heads, Vises, Work Holding Fixtures, and Arbors. Write today for descriptive folder.

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Combination Etchtool — —3— Tools in 1



Luma Marking and Demagnetizing SIMULTANEOUSLY

Writes on hardened steel — demagnetizes at the same time—with carbon point does light spot annealing and soldering jobs. Compact—easy to use—dependable.

Send for details—5-day FREE TRIAL OFFER!

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WITH REPLACEABLE POINT

GREATER ACCURACY • LONGER LIFE • HEAVIER LOADS • FASTER PRODUCTION



No. 2 MT $25.00
No. 3 MT 27.50
No. 4 MT 38.50
No. 5 MT 52.50

MOST ADVANCED LIVE CENTER MADE!

Replaceable point affords indefinite life—Tapered seat maintains perfect alignment—Very short overhang eliminates chatter—Special preloaded heavy duty bearings for heavier loads—Point is hardened and ground tool steel—Case is hardened and ground—Seat of case ground on bearings—Special points available on request.

FISHER TOOL COMPANY

226 Lafayette St., N. Y. 12, N. Y.

A USEFUL ADDITION



Modern precision machine shops and inspection departments will find this sturdy 36"x 48" MILWAUKEE SURFACE PLATE a valuable addition. Constructed of semi-steel, accurately machined, securely mounted on cast legs which are machined and provided with SAE adjusting screws for perfect alignment. Height from floor to top of plate 30". Can also be had in 38". Shipping weight 1200 lbs.

We also manufacture angles and parallels as shown underneath surface plate.

We also make larger and smaller plates either with planed or scraped surfaces, whichever is desired. *Write today for full information.*

J. C. BUSCH COMPANY

ENGINEERS AND MACHINISTS SINCE 1907

165 SO. BARCLAY ST., MILWAUKEE 4, WIS.



JOHN'S DRILL JIGS FOR TAPPING MACHINES

These jigs are now provided with universal jaws which permit quick set-up for end drilling and tapping.

The reversible V plates accommodate a large range of diameters.

WRITE FOR DETAILS

HEUSER MFG. CO.

1638 N. Paulina St., Chicago, Ill.

YOST DRILL PRESS VISE



This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

Offered in two sizes.

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	3½	12½
2D	5	5½	23

Do you need a vise of ANY type?

Write today for bulletins on the extensive Yost line

YOST MFG. COMPANY

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MEADVILLE, PENNSYLVANIA

7 or more end mills, with the additional advantage that any intermediate size may be obtained. Clark Surface Facer is the trade name of the new device, and according to the manufacturer, shipments are now being made promptly on suitable priorities.

LIGNUM-VITAE WARTIME REPORT

Said to be the first comprehensive report of what Lignum-Vitae is doing to help win this war, is a publication holding much in the way of helpful suggestions to manufacturers bedeviled by shortages and impossibles-to-get in war production.

While it has been known and used for centuries, this very hard, resinous wood of the Tropics should not be confused with ordinary hardwoods. For Lignum-Vitae is asserted to be the hardest, heaviest, closest-grained of all woods. Its density equals that of iron. It weighs about 831 lbs per cubic foot, and it has a specific gravity of 1.3. Running about 30% of weight, it contains a natural gum which, combined with its pressure-resistant quality adapts it for a host of mechanical uses, plus new ones being added almost daily under the impetus of war production needs.

Bearings form a prominent part of the uses to which this material has been put. And in this field, alone, there are many instances of unusual applications, wherein the wood more than suffices for scarce metals. It has a pressure resistant modulus of 11,200 lbs psi! Its resin has lubricating qualities rendering it peculiarly capable of stepping into the breach where underwater bearings are demanded.

The booklet gives an interesting array of applications of the wood, among which you may find just the help you've been looking for. Write Lignum-Vitae Corp., 731 Boyd Ave., Jersey City, N. J.

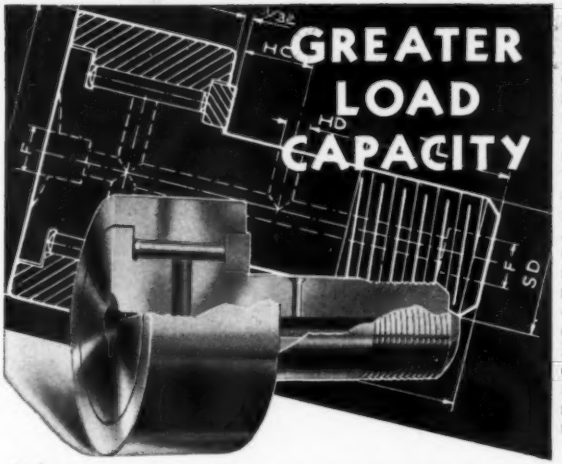
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Hardened throughout, self-compensating for wear, precision built. For top production on small South Bend, Sheldon, Clausing, Atlas, Logan and similar bench lathes and small screw machines.

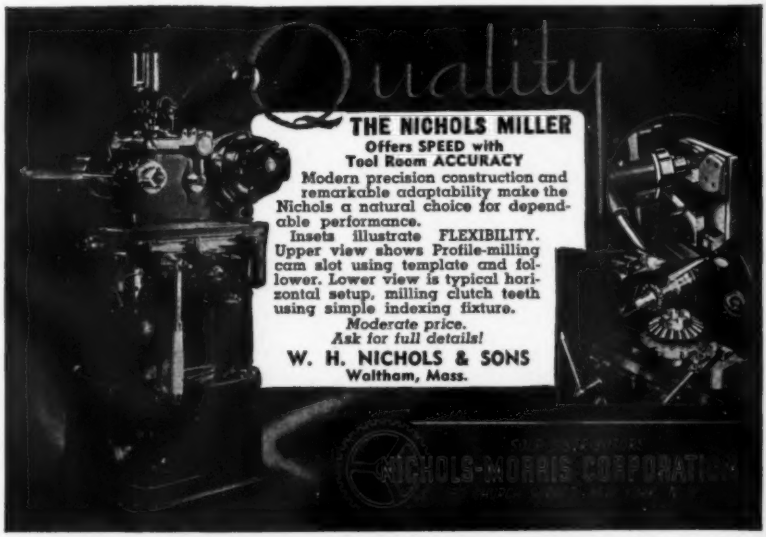
F & M SALES COMPANY, HOLLYWOOD, CALIF.

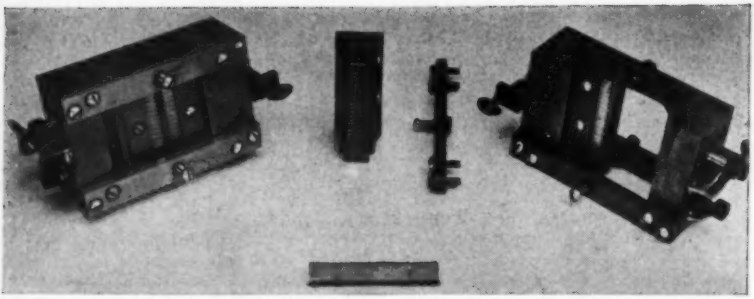
Manufacturers and Selling Agents



McGILL Cam Follower Full Type Roller Bearings have a greater load carrying capacity for a given overall width, and occupy relatively little radial space, as compared with plain bearings and ordinary ball bearing cam followers. Added advantages include effective sealing and the absence of small retaining washers or otherwise delicate extra parts. McGILL Cam Follower Roller Bearings are made in a variety of sizes. Write for Bulletin No. CF-40A.

McGILL MANUFACTURING COMPANY, INC.
Valparaiso, Ind. Bearing Division — 1100 N. Lafayette St.





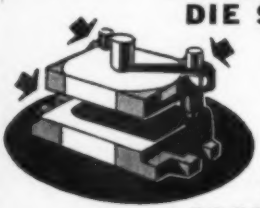
COMPRESSION YIELD STRENGTH TEST

A new jig for the determination of compression yield strength in aircraft design has been developed by W. P. Montgomery and R. L. Templin and is now being offered by the Baldwin Locomotive Works, Philadelphia, Pa.

It has been the custom to obtain values for compression yield in sheet metal by testing the sheets in packs. The sheets would be piled up to a thickness equal to the width of this test sheet and the pack would then be supported by needle points held in a special fixture.

With the new method developed by Montgomery and Templin, it is possible to test a single thickness of sheet in compression, supporting the sheet in the jig as shown in the photograph with a

DANLY PRECISION DIE SETS



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You can handle 90% of your requirements with Willey's General Purpose Tungsten Carbide Tools, which are suitable for machining cast iron, tough hard rubber, bakelite, fibre and tough alloy steels.

Willey's General Purpose Tools give you low prices, increased production and lower operating costs. **Prompt deliveries** on these standard tools.

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MILLING MACHINES
Make Fast Work of Small Jobs

Motor Driven

Timken roller or ball bearings to spindle



Write today for circulars.

Burke Machine Tool Co.
297 E. 16th St., Conneaut, Ohio

HARGRAVE
the right CLAMP for every job



War plants are taking our entire output of clamps —and gaining increased efficiency and improved results. These heavy demands make it difficult to fill all orders. See your supplier—he'll do his best to help.

Stock sizes range from ¾" to 10" openings, from ⅛" to 16" deep, all patterns, all sizes.

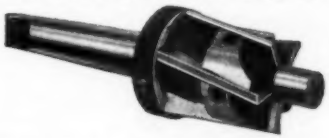


The **CINCINNATI TOOL** *Co.*
Est. 1879
1945 WAVERLY AVE. CINCINNATI, OHIO

multiplicity of small rollers. The extensometers are attached to the edges of the sheet.

The testing of the material in single sheet form requires a smaller load and simplifies the technique of testing to a large extent. The Montgomery-Templin jig—simple and inexpensive—reduces the apparatus to its lowest terms.

FOR FACING, COUNTERBORING



Two new tools for facing and counterboring have recently been added to the Genesee line. Essentially the same in principle, one is designed for roughing cuts, where maximum stock removal is sought; and the other for fine finishing cuts, for smooth, accurate finish.

Advantage of tools like these is that they help to utilize machines to fullest capacity at fractional cost of solid tools, which lose efficiency after repeated grinding, decreased chip-clearance making for clogging with subsequent slowed production.

Replaceable blades in these tools make continual replacement unnecessary. Blades can be sharpened at reasonable cost. One set is said to outlast 3 to 5 solid tools. Blades are locked and rigidly supported in heat-treated, chrome nickel steel body of 1-piece, chatter-proof construction. Half turn of lock-screws quickly releases blades for adjusting and replacement. Chip space remains 100% clear at all times, says the maker, Genesee Mfg. Co., Rochester N.Y., whose catalog No. 42 contains full details.

SPEED-UP YOUR PRODUCTION with

G-W—Special "C" Tool Bits
G-W—Special "T" Tool Bits

GERITY-WAYNE TOOL COMPANY
6432 Cass Ave. Detroit, Mich.



PATENT APPLIED FOR

ABER

SPECIAL

Curved Tooth

MILLING CUTTERS

with

"CHATTERLESS FLOWING ACTION"

- Higher Speed (R.P.M.)
- Longer Cutting Surface
- Longer Life

There is no lapse of cutting contact. Each tooth begins to cut just as its predecessor is finishing its cut. The continuous shearing is known as "Chatterless Flowing Action." Smooth, accurate finishes are maintained. Increased speed (RPM) means increased production. Save time and money with ABER curved tooth milling cutters.

WRITE FOR LITERATURE

ABER ENGINEERING WORKS, INC., WATERFORD, WIS.

Blade Breakage Stopped Production Insured

BY INSTALLING

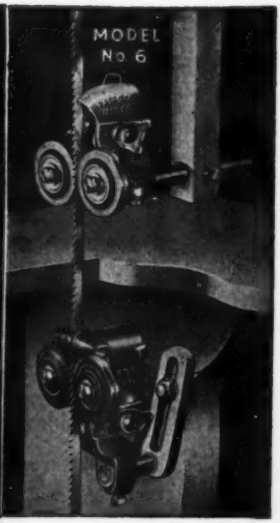
PADDOCK Ball Bearing BAND SAW GUIDES

Recommended for New and Old Machines cutting all material at any speed.

SENT ON 10 DAYS' TRIAL

The use of Paddock Ball Bearing Guides increases the efficiency of the machines so that more and better work can be done. The hazard of operation is reduced. Most of the blade breakage is eliminated. Wheels are interchanged—in effect, three sets of guides in one.

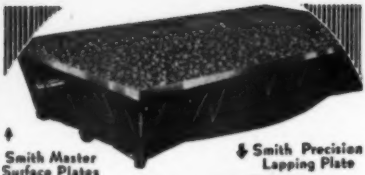
Write for details today and list of prominent manufacturers using Paddock Guides.



PADDOCK TOOL COMPANY

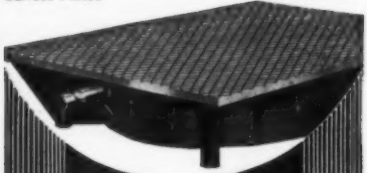
Guide Makers Since 1920

1418 Walnut St., Kansas City, Mo.



Smith Master Surface Plates

Smith Precision Lapping Plate



ENGINEERED for *Precision* Usage

Smith Master Surface and Lapping Plates have become the standard for precision accuracy in aircraft and ordnance plants all over the country. Gauge makers who demand a superior surface plate and precision accuracy are standardizing on Smiths.

For sizes, prices, and delivery, wire, phone or write.

SMITH TOOL & ENGINEERING COMPANY

854 N. Sandusky Ave. Bucyrus, Ohio

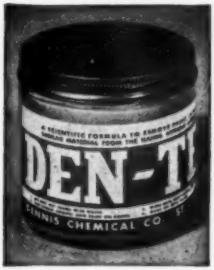
Elliptical rib construction exclusive with Smith



Smith Master Surface Plate and Stand

PAINT AND LACQUER REMOVER

Den-tex is a new compound for removing lacquer, dopes, enamels, varnish, resin solutions and paints from the hands without the use of explosive solvents.



Previously, it has been necessary to use solvents, often toxic and explosive, to remove these materials. The pre-caution of masking the skin with creams reduced, but did not eliminate need of these hazardous solvents.

To use Den-tex, it is merely worked into paint or lacquer on hands and then readily rinses off with water, leaving the pores open and clean and the skin soft.

Complete information can be obtained from the manufacturer—Dennis Chemical Co., 2701 Papin St., St. Louis, Mo.

MARCO TOOL POST

A new Multiple Purpose Tool Post has been developed by Marco Company, Inc., Wilmington, Del. It is built in two sizes to accommodate six or eight tools. According to the makers, it has effected a saving of as much as 30% in change-over time in their own shop, permitting as many as eight different operations at one setting, such as screw cutting, drilling, reaming, cutting-off, threading, chamfering, forming, etc.

Fig. 1 in the accompanying drawing is a top view of the Post arranged for six tools. Elevation in Fig. 2 shows how the Post is clamped to the carriage of an ordinary engine lathe in place of the regular tool post. The handle (7) is convenient for clamping the Post in any position. Body of the Post (11) is lifted by the spring (12) above the key (13) whenever the handle (7) and nut (9) are unscrewed. The keys (13) lock each tool in its proper position.

The Post is provided with set screws for tools (18) but holes for tools must be bored and reamed after Tool Post is



Special Container for narrow width coils, 100' l. Convenient to use.

ATLANTIC★ Band Saw Blades

Speed Up

Metal Cutting Production

Atlantic Metal Cutting Band Saw Blades have been developed through twenty years of research and specialization.

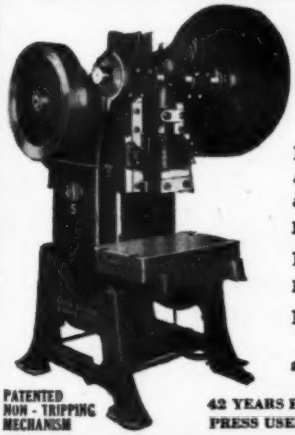
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ATLANTIC SAW MFG. CO.

Metal Cutting Band Saws Exclusively

153 Brewery St., New Haven, Conn.





PATENTED NON-TRIPPING MECHANISM

UNLIMITED PEAK PRODUCTION

Much larger die space than average presses. Engineered and designed for unlimited peak production.

Reinforced construction at points of greatest wear.

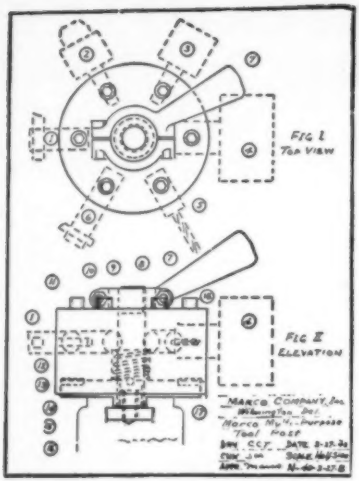
If you want the best, send illustrated catalog describing complete line TODAY.

With Modern

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42 YEARS ENGINEERING EXPERIENCE BUILT INTO EVERY JOHNSON PRESS USED BY LEADING MFR'S. THROUGHOUT THE WORLD.

JOHNSON MACHINE AND PRESS CORP., ELKHART, INDIANA



clamped in position on lathe carriage (17).

After tool post is set and bored for tools, one or two taper pins are provided to lock the cross carriage in a central position, so Post can be replaced in its proper position if removed.

The regular model carries six tools. A larger size to carry eight tools is available for larger lathes. In ordering, give make and model of lathe, width of tool post slot and vertical distance between top of this slot and center of spindle.

MODERN BELT DRIVES

"Handbook of Modern Mechanical Power Transmission for Industry", a graphic presentation of the most recent engineering procedure in designing and maintaining group drives for efficient power transmission, is offered by Cling Surface Co., 1048 Niagara St., Buffalo N.Y.

Especially timely with the WPB urging industry to conserve electric motors and accessory equipment, the book points out simplicity of converting from individual to group drives, with consequent reduction in equipment needed.

It explains correct grouping of machines, proper engineering of drive components and correct care of belts for long-term service.





COMPOUND ANGLE MAGNETIC CHUCKS

Accurate, positive, sturdy. Made in two sizes. Junior model has 360° swivel base. Call on us for dependable chucks and rectifiers. We have a complete line of sizes and types.

GRINDING MACH. TOOL AND SUPPLY CO.
10226 Woodward Ave., Detroit, Mich.



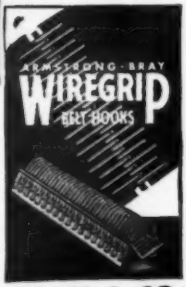
BELT LACING
Both types from 1 source

BELT HOOKS come with blue aligning cards that prevent waste—every hook can be used. Protects fingers. Applied with a WIREGRIP or any other standard Belt Lacing Machine. 6 sizes.

STEELGRIP BELT LACING

A strong lacing for all types of belts. Put on with a hammer in a few minutes. Clinches smoothly into belt, compresses ends, prevents fraying. 2-piece hinged rocker pins provided. 8 sizes. In boxes, handy packages, cartons and long lengths.

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ARMSTRONG-BRAY & CO.
"The Belt Lacing People"
5364 Northwest Highway Chicago, U.S.A.



SAVES LABOR

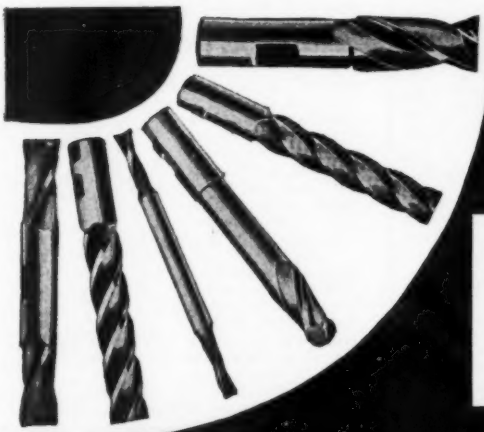
You will eliminate many costly hours from your Payroll by using the JACKSON TIME-SAVING VISE. It saves the time wasted by your Machinists in hunting for Bolts, Clamps, Angle Plates, etc., when rigging up work on the Drill Press, Miller, etc. Of still greater importance is the saving in output you effect by not having your productive machine standing idle during the rigging up process, for the—

JACKSON TIME SAVING VISE

by means of its revolving jaws and supplementary jaws instantly holds the thousand and one shapes that arise in machine work.

SEND FOR BULLETIN NO. 23-B

BROWN ENGINEERING CO. 126 N. THIRD ST. READING PA



Shear Cut— High Speed

END MILLS

Shear Cut End Mills are offered in all standard sizes, single and double end.

Write for catalog and prices today.

PROGRESSIVE TOOL & CUTTER CO.
2345 WOLCOTT ST., FERNDALE, MICHIGAN



Boyar-Schultz
PROFILE GRINDER No. 1

For Profile Grinding in Production and in the Tool Room

A TIME saving machine tool in the tool and die shop, Boyar-Schultz Profile Grinder No. 1 is also recognized as equally efficient in production work where contours and profiles must be quickly ground.

The spindle operating at the high speed of 20,000 R. P. M. permits the use of small diameter wheels in confined openings.

New uses are being constantly discovered for this Grinder. Among them are dies and molds for plastics and grinding cams and other parts made of hard plastic materials.

Boyar-Schultz Corporation
2108-J Walnut Street, Chicago 12, Illinois

BOYAR-SCHULTZ CORPORATION
2108-J Walnut Street, Chicago 12, Illinois

Please send me information about Boyar-Schultz Profile Grinders.

Name .....
Firm .....
Address .....
City ..... State.....

TOOL ALLOCATION

The War Production Board on July 7th moved to establish a simpler and more effective method of allocating machine tools to foreign purchasers and domestic purchasers other than obtaining these tools thru the Armed Services. This action was taken in an amendment to General Preference Order E-1-b, which also is designed to prevent the delivery of machines to distributors for stock on a consignment basis.

About 75 per cent of the machine tools manufactured in this country has been allocated to the Armed Services and their contractors. The remaining 25 per cent has been scheduled in accordance with preference ratings.

Two principal provisions of the amendement are:

1. It prevents the shipment, under any circumstances of machine tools to dealers for stock.

2. The sequence of delivery among the 25 per cent of production allocated to foreign and "other-than-Service" purchasers is now determined by the date of receipt of the preference rating certificate, whenever the rating is A-1-A or higher. If lower than A-1-A, deliveries are in accordance with preference ratings.

General Preference Order E-1-b as amended, issued July 5, 1943.

GUSHER COOLANT PUMP



Designed for deeper immersion this vertical "Gusher" Coolant Pump is said to handle soluble coolants containing grit and abrasives without injury. The unit, with greater immersion length, is provided with integral mounting flange, usually bolted to the reservoir cover or bedplate, forming a simplified installation in connection with a comparatively deep reservoir, frequently arranged below floor level.

No packing glands or friction seals are used. There are no bearings or metal-to-metal contacts below mounting flange.

The shaft, which rotates on two large high grade ball bearings, is of one-piece construction ground accurately to in-

sure balance. It extends from motor thru tubular housing to pump impeller.

One ball bearing is mounted in upper motor end bell, and the other within the mounting flange housing, providing sufficient distance between ball bearings to maintain rigidity in the heavy shaft extension. Weight and thrust of the vertical shaft are taken by the large lower ball bearing which is locked into position. This feature, it is said, eliminates change in position of Pump impeller both before and after motor reaches normal operating temperature.

Pump is available in two lengths from the mounting flange to bottom of the Pump, one-23⅝" and the other 19⅝". A ½ hp totally enclosed motor is used for continuous duty, and a ¾ hp motor for extra heavy duty.

Further information is available from The Ruthman Machinery Co., 1810 Reading Road, Cincinnati.

COLLOIDAL GRAPHITE IN INDUSTRY

A new 12-page illustrated bulletin, No. 430-ZZ, presents importance of "dag" colloidal graphite to modern industry.

This bulletin describes the physical and chemical properties of "dag" colloidal graphite and how it differs from other forms of graphite, especially in regard to particle size which is of extreme importance to the industrial application of this material.

It points out the importance of Dr. Edward Goodrich Acheson's discovery of the process for making graphite of exceptional purity in the electric furnace and then reducing it to a colloidal state. In fact, it was this discovery which made colloidal graphite commercially available for such a great number of industrial applications where it alone is adequate.

It discusses the reasons for liquid carriers and how dispersions are accurately controlled. Farther on, it goes into the subjects of "dag" colloidal graphite as a lubricant for running-in engines, for high temperatures, for impregnating porous bodies, for use as a parting compound, and for electrical applications.

It summarizes all standard colloidal and semi-colloidal dispersions and illustrates a number of typical applications. Copies are available from Acheson Colloids Corp., Port Huron, Mich.

Every dollar we can spare is needed. — BUY BONDS!



Boyar-Schultz
PROFILE GRINDER No. 2

For Larger and Heavier Contour Grinding

DESIGNED for grinding difficult contours and profiles in heavy tool and die work, it is also highly successful in production profile grinding as applied to tanks, aircraft and other heavy industry.

Boyar-Schultz Profile Grinder No. 2 is the type of machine tool that will be most important in the coming change from Production for War to Production for Peace time pursuits.

Made in two models — with Dual Spindle as shown above or with Single Spindle. Both operate at the high speed of 10,000 R. P. M. which assures efficient grinding even with small wheels.

Fill in and Mail Coupon on Opposite Page

BOYAR-SCHULTZ CORPORATION
2108-J Walnut Street, Chicago 12, Illinois



Let Your MEN do MEN'S Work

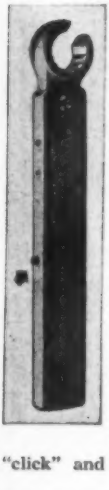
For those fetch and carry jobs . . . use

PORTELVATOR (Portable Elevating Table)

PORTELVATOR can take it . . . take heavy dies or machine parts . . . finished or unfinished work . . . stock . . . anywhere in your plant. Also, fine as support for overhanging work. Capacities up to 20 tons.

THE HAMILTON TOOL CO.
Ninth and Hanover Streets.
HAMILTON OHIO

SNAP TORQUE WRENCH



A snap-acting torque wrench which gives both audible and physical signal when predetermined torque load is reached, is offered by Tubing Seal-Cap, Inc., 215 West 7th St., Los Angeles.

Trade named Livermont Torq-Snap, it requires no visual attention as there are no dials or indicators. Set to the desired predetermined torque load, it gives an audible "click" accompanied by a definite physical sensation transferred to the operator's hand, when proper load is reached.

Simple in design, it works on the principle of spring bar deflection. Deflection in the main bar bends a secondary spring which snaps over center when the preset torque is reached. This causes a slight drop in the torque curve, makes the "click" and actuates a "button" in the handle giving a physical signal in the palm of the operator's hand. This double indication not only provides 2 warnings, but also makes it practical to operate the wrench in restricted areas where indicators or dials could not be seen.

The Torq-Snap was developed by Tubing Seal-Cap for a large aircraft manufacturer where it passed exhaustive tests. Instead of wide variations in applied torque loads formerly unavoidable in aircraft plumbing, the Torq-Snap operates within a very close tolerance, according to the manufacturer. Twelve sizes will be available with open or box ends, either offset or straight.

YODER SHELL CROPPER

A "shell trimmer" that saves much labor-time, shipping charges and scrap handling, is offered by the Yoder Co., Cleveland, Ohio. It was developed by this company in collaboration with The Dresser Mfg. Co., Bradford, Pa., who make shell forgings.

By trimming the crop end of the shell forging while it is still hot at the forge plant, this "trimmer" saves the cost of shipping the ends. It saves cold-sawing



GAIN TIME— SAVE POSTAGE

By Shipping Parts in Amesacks

You can save up to 90% of packing and crating time, and up to 50% of postage and packaging cost by using Amesack parts bags and mailing bags in your shop. You can also speed production with Amesacks in many cases. Write today for samples, prices and for FREE reprint: **"Cotton Bags in Work Expedition."**



THE AMES BAG CO.
1971 EAST 66TH STREET • CLEVELAND, OHIO



JANETTE SPEED REDUCERS

Your SLOW SPEED machines of from ***.08 r.p.m.*** and higher, ***1/50 to 10 H. P.,*** can be driven without using belts, pulleys, line shafts, chains, sprockets or slide rails, if you use one of the ***47 types*** of Janette speed reducers.

WRITE for our 100-page Catalog TODAY.

Janette Manufacturing Co
556-558 W. Monroe St.
Chicago, Ill.

HOPPERS

THE FASTEST FEEDING HOPPER EVER DESIGNED

Feeds Screws, Screw Blanks, Nuts, Rivets, Pins, Bearing Rollers, Plain Washers, Discs, Bullet Cores, Special Parts.

Hoppers Adaptable To Any Machine.

Send Sample Parts For Feeding Speed.



DETROIT POWER SCREWDRIVER CO.
2809 W. FORT ST., DETROIT, MICH.

ALL THESE PATTERNS WITH STRAIGHT KNURLS



GRAHAM KNURL HOLDER FITTING LATHE TURRET

One pair of straight-cut knurls will make an endless variety of patterns when used in our adjustable Knurl Holder. Handles work up to 2½" diameter. Shank individually made to fit your turret.



Request Illustrated Price Circular.

GRAHAM MFG. CO.

52 Bridge Street East Greenwich, R. I.



Type E BLOWER

can be equipped with multiple adapters for flexible hose.

Properaire **BLOWERS**

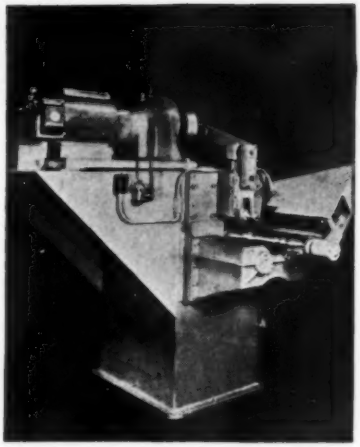
• Several sizes. Direct and belt drives, handling one or several different jobs at same time. Silent. Powerful. Dependable.

• Exhaust and induced draft blowers to solve air-moving jobs quickly, easily, economically. Shipped ready for installation.

Ask for Bulletin A.

Grand Rapids Die & Tool Co.

Scribner Ave., Grand Rapids, Mich.



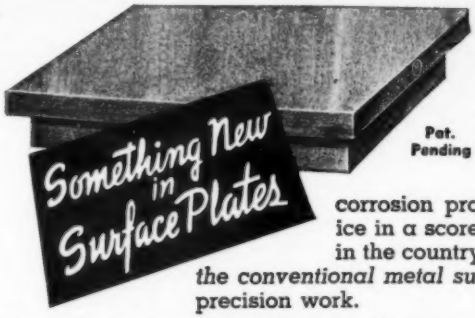
this end and considerable scrap handling.

The shell is cropped at forging temperature and machine should be set in the forge line, immediately following final sizing operation. By means of a simple adjustment, shell forgings ranging in size from the 60 mm trench mortar thru the 155 mm high explosive shell can be cropped. A production of 270 cuts per hour on the 105 mm shell can be realized.

Since it is possible to hold bottom of the shell forging cavity firmly against end of gauging mandrel all during cutting operation, the length can be held to close tolerances. This eliminates the cutting off and facing operation heretofore necessary in the machining line.

The machine is nearly automatic in operation, the hot forging being slid from conveyor over mandrel. The start button is depressed. An air operated arm holding shell against locating mandrel swings into position. This mandrel, locating from the cavity bottom, gauges shell length. While held in this position forging is rotated by the two driven rolls that support it. The disc type cutter is then fed automatically through forging wall. A roll located on mandrel prevents formation of an internal burr.

On completion of cut, operator ejects the forging along with the cropped end by actuating an air operated ejector, and the cycle is repeated. Cutter life is said to be unusually good so that continuity of operation can be maintained.



Pat. Pending

Made of natural granite and almost diamond-hard. Permanently accurate to 1/10,000 inch overall. No internal strains to cause warpage. Rust and corrosion proof. Already in service in a score of the largest shops in the country. *Destined to replace the conventional metal surface plates* for high precision work.

Non-critical material and prompt shipment on stock sizes.

Get further particulars, sizes and prices on the surface plate of the future — The Herman precision plate made of ages old "diamond-hard" granite. Write now, while you're thinking about it.

THE HERMAN STONE CO.

1240 Leonhard St. **Dayton, Ohio**



SURFACE GRINDERS

Hydraulic Feed – Hand Feed

No. 2 HAND FEED 6x22
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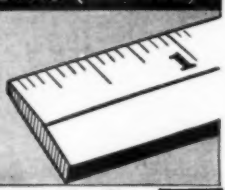
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With Two Lives



Only experienced gage specialists with finest equipment can insure such precision. To this United *adds another life to the gage.* Each end, "Go" and "No Go" reversible. Turn either end when worn and you have a new gage. Plugs locked by bronze split collet in one handle. UPPCO lapped enduring finish. Sizes: .030 to 1".

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"STUDIES IN ARC WELDING"

New information on arc welding of great interest and value in war production and with many extremely important peacetime applications is soon to be made available by The James F. Lincoln Arc Welding Foundation in the form of a 1200-page book containing 98 of the outstanding award studies submitted in the Foundation's 1940-1942 Industrial Progress Award Program, according to announcement by the Foundation.

Entitled, "Studies in Arc Welding," it will make available the accumulated knowledge and experience of more than 100 engineers, designers and others applying themselves individually to a specific design study involving arc welded construction.

While the vast majority of the studies to be published involve products of plants engaged in war work, the principles and practices reported in the individual papers will be of inestimable value in post-war uses of the arc welding process.

"Savings in critical materials and in production costs, reported available by arc welding in the award studies of designers, engineers and others in the $200,000 Progress Program," read the Jury's appraisal when the awards were announced last year, "assume such proportions as to be of vital national significance.

"The figures, based on representative products and structures, show a possible annual cost saving of $1,825,000,000. This includes 7,000,000 tons of steel valued at $271,000,000 and 153,000,000 man-hours of labor. This $271,000,000 is a conservative figure calculated at base prices of $34 per ton for billets and slabs and $42 for plate.

"These economies, available through arc welding, were being tapped by peacetime and defense industries at the time of Pearl Harbor. Since then, emergency demands involving steel and time, are lending tremendous impetus to the application of arc welding to war production.

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Does the thinking for the operator.
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With Operators New to Industry

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NO. 17 "M" TYPE BUFFING LATHES ARE WELL ADAPTED FOR POLISHING — BUFFING OF LARGE AND AWKWARD WORK.

The "M" type Buffing Lathes are well adapted to the Buffing and Polishing of large or awkward work, which requires ample room for swinging; also in many instances where a satisfactory spindle speed may not be obtained with direct connected alternating current motors. Here a speed may be selected which will meet most requirements.

Features V belt drive, ball bearings thruout, accurately ground high carbon steel spindles and has a varied speed range easily obtained.

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QUANTITY DISCOUNT TO INDUSTRIAL FIRMS

NATURAL FOODS IN WAR

Tests made recently in an aircraft factory showed 40% of the workers deficient in vitamin A; 21% in vitamin B; and 42% in C, according to Dr. Victor G. Heiser, medical consultant, National Ass'n of Manufacturers. "Of the 132 million people in this country, approximately 97 million are ill-fed," Heiser stated.

Correction of such conditions is a nutritional problem rather than a remedial one. "They can be overcome," states Mrs. Ethel Austin Martin, Director, Nutrition Service, National Dairy Council, "by building menus around an adequate nucleus of the protective foods, including milk and its products, eggs, leafy vegetables, raw fruits and other vegetables, meats and their equivalent in other foods of animal origin." Unless they are overcome, the nation's production capacity, so sorely needed in the war program, is gravely impaired.

Such a balanced diet normally contains all the vitamins and minerals the body needs to get the most out of its food. American industry, both individually and thru the National Ass'n of Manufacturers, is urging workers to eat these fundamental foods first and then anything else they wish. Activities on the part of industrial leaders are shown by a constant increase in mid-meal lunches of milk, sandwiches and fruit, as well as greater attention to the diets of employees in company-owned cafeterias. Leading manufacturers report that these activities are already resulting in sharp decreases in absenteeism due to illnesses and to increases in production of essential war materials.

"Superior food values of milk including calcium, riboflavin and proteins are important factors in maintaining our armed forces in better condition than any previous war," states Mrs. Ethel Austin Martin. "Intelligent use and distribution of the best available food supplies to the Army is proving an important factor in keeping our fighting forces in top form."

Food is one of our most important allies in aiding us to victory.

NEW BINS



for assembling small parts

Floors slope to feed parts to front — end reaching and fumbling.

Bins taper toward front to form convenient semi-circle —keep all bins within easy reach.

Nesting, locking construction for rigid set-ups, easily changed when necessary.

All-welded construction. Rolled, smooth edges.

Two sizes—tapered or straight edges. Hoppers available for steady work.

Write Stackbin Corporation, 55 Troy St., Providence, R. I., for further details and low prices.

STACKBIN SYSTEM

"Stacked and Still Accessible"

STACKBIN CORP., Providence, R. I.



IMMEDIATE DELIVERY! ATLAS DIE FILING MACHINES

Can be used for all kinds of die making. The overarm is constructed so that the file and saw attachments may be interchanged with little effort. The holddown fingers are attached directly to the overarm. Working surface of the table, which tilts two directions, is entirely clear. An improved type chuck, consisting of movable hardened jaws, holds both saws and files. Screw adjustment makes changes easy and fast.

Price Complete With Motor

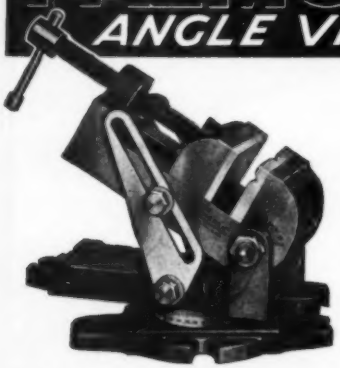
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103 S. Clinton St., Chicago, Ill

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Solve Difficult Angle Jobs

★ For Tool Room — Production Line — Bench.
★ Speed up work — End Makeshift Methods.
★ Quick Accurate Setups at any angle.
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★ All Parts Accurately Machined.
★ Jaws Hardened Steel — Plain or Grooved.
★ Made in Sizes from 1½" to 8" Jaws.

Write for circular 0-8 "101 Angle Operations" and complete line of PALMGREN Vises.

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Mfrs. of PALMGREN PRODUCTS for over 25 years
8384 South Chicago Avenue, Chicago, Ill.









PRECISION WORK AT ANY ANGLE

PAINT PLANT MAKES "RUBBER"

A rubber-substitute that can be made in paint factories from vegetable oils and without use of critical materials was announced today as suitable for food jar rings, cements, stoppers, erasers, floor mats, tapes and other civilian and war products. Known as Kem-Pol, it was developed by the Sherwin-Williams Co., and is being produced in carload lots in the company's Chicago plant.

Its properties were described today by W. T. Walton, Sherwin-Williams research chemist in charge of Kem-Pol production, at annual meeting of the American Chemical Society's Division of Rubber Chemistry in New York.

In discussing the present production of the Kem-Pols, Walton said that the huge Chicago plant of the company has been making it in quantity for many months. Walton made it clear that Kem-Pols are not synthetic rubber, but rather substitutes, replacements and extenders for natural, synthetic and reclaimed rubbers in those cases where lower tensile strength and elongation are permissible.

A wide variety of war and civilian applications is indicated for the Kem-Pol group, and among the uses suggested by Walton are treads, mats, hose, braided tubing, pads, erasers, food closures, gaskets, felting, fabric coatings, tapes, sealing compounds, adhesives, stoppers and cements.

Four different types of Kem-Pols were identified as follows:

Kem-Pol No. 4 is a viscous liquid, amber in color. It is easily soluble in aliphatic and aromatic hydrocarbons and may be emulsified. It is intended for use as an adhesive and is not recommended for the preparation of mill stocks or molded articles.

Kem-Pol No. 54 is of intermediate viscosity. It is a viscous, tacky, semi-solid gel-like material. It is also soluble in aromatic and aliphatic hydrocarbons and will emulsify. Its color is the same as that of Kem-Pol No. 14.

MODEL No. 16 "SPECIAL"

CONSTRUCTED AS PER SPECIFICATIONS OF U. S. NAVAL AIRCRAFT FACTORIES

BUTTERFLY FILING and SAWING MACHINE

(Die Making Machine)

This is a very heavy, powerful machine and is designed for extra heavy filing and sawing, but it performs small work just as well. This type of machine is usually adopted in Ammunition Plants, Airplane Factories and machine shops where heavy and precision filing and sawing is desired. We also manufacture smaller models—Model D-10" Table; Model E.L. 12" Table.

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Our machine carries the Butterfly trade mark.



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they're better!

Simplex Machinists' Jacks speed leveling of work on planers, milling machines and other machine tools. Notched base for fastening to bed. Self-leveling ball and socket cap. Side lock nut holds screw at desired height. 4 sizes: 2¾", 3¾", 5¼" and 7½" closed heights.



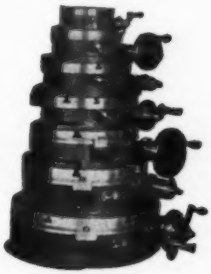
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agency unless authorized by the Bureau. The Advisory Committee, concerned with the circulation of questionnaires that have not been so authorized, advised businessmen to exercise more caution about those report forms that are suspect. "Inquiry should be made of the Advisory Committee, or of the Bureau of the Budget whenever doubt exists as to whether use of a report form has been authorized," the Committee announcement said. "Whenever desired, no disclosure will be made of the person or organization making the inquiry.

W. J. Donald, Chairman of the Advisory Committee, added "While inquiries about suspected forms may be made directly to the Committee or to the Budget Bureau, business men may, if they prefer, write directly to the Federal agency issuing the form, or instead to their trade association, chamber of commerce, retail organization, professional society, or other organization, which may in turn communicate in confidence with us.

"Business and industry are still largely unaware that a mechanism has been established by which governmental information requests can be kept to a minimum," Mr. Donald said.

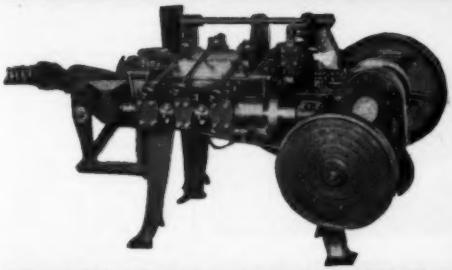
EXAMINE QUESTIONNAIRES

Corrective measures regarding the issuance by Federal agencies of unauthorized questionnaires, existence of which are imposing an unwarranted burden on American business, are reiterated by the Advisory Committee on Government Questionnaires, with the concurrence of the Bureau of the Budget.

With a few exceptions requests for information, as defined by law, are subject to the review of the Bureau of the Budget and may not be issued by a Federal

TO MEET TODAY'S *INDUSTRIAL REQUIREMENTS*

THE NILSON AUTOMATIC METAL AND WIRE FORMING MACHINE



The Nilson Automatic Metal and Wire Forming Machine meets today's industrial requirements. Here are some of the features of this machine. Open construction of press and forming tools. Patented slide feed with an independent cam-operated wire gripping device. Power operating wire feed is transmitted through a straight line.

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DESMOND

GRINDING WHEEL

DRESSERS and CUTTERS



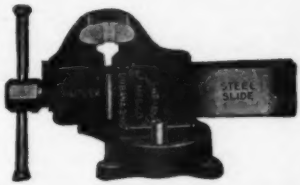
We can supply you with the proper Dressers and Cutters for all of your grinding wheels.

Ask for copy of our catalog and name of your nearest dealer.

SIMPLEX

Steel Slide

VISES



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A NON-FERROUS HIGH SPEED CUTTING ALLOY WITH THESE ADVANTAGES:

- **Hardness at high temperature**
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- **Requires no change in equipment**

Write for catalog and prices.

CROBALT INC.
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INDUSTRIAL MUSIC

Value of "Industrial Music"—selected broadcasts over plant speaker systems, is gaining in realization. It seems to be turning the trick, regardless of whether the work be heavy or light. Even where work is exacting and involves high degree of precision, favorable results in morale and output are reported by many plants.

It's not at all surprising. The idea isn't new. It has a long success-record in the cigar-making industry—down Havana way, for example, where "readers", often cooperatively retained by the employes, themselves, took the place of modernday mechanisms.

While it may not be news to you, Providence, R. I. Journal seems to think that it is. In a full page feature in its edition of Sunday, June 6, it describes and pictures how Electrix Corp., Pawtucket, R. I., is using Industrial Music to advantage.

Engaged in important war work, the company operates on a two-shift basis, the day shift working from 7 a. m. to 5:45 p. m. and the night shift working 12 straight hours from 6 p. m. to 6 a. m.

"It's a tough grind," Vice President, Irving Shein pointed out. "That's why we like to provide a little entertainment now and then."

So close is the precision work, that even atmospheric conditions in the plant have to be taken into consideration. This leads to frayed nerves, Shein asserted, and the company owes it to the employes to break up the day with music and news.

The music for broadcasting throughout the plant is carefully selected. It has to be the proper tempo. Providence Journal news broadcasts are tuned in on the radio and relayed over the loud-speaker system. Radio programs include also beside ball games, speeches by prominent Congressmen or Senators or any speeches by the President.

" The importance of their work makes them want to turn out the stuff. We don't have to keep lecturing them," Shein said.



SAVE Labor and Time

Eliminate heavy lifting. Cut handling costs. Table swivels and locks in any position. Can be varied 15½° by slight foot pressure, leaving operator's hands free. Engineered and built by tool engineers, experienced in production of special machines, dies, jigs and fixtures for exacting requirements.

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PORTABLE INSPECTO-GRAPH

Can be used anywhere by merely plugging into nearest 110 volt A.C. outlet. Two fluorescent tubes concentrate shadowless, diffused light on object to be inspected. Large four-inch lens magnifies work without distortion. Saves workmen's eyes and quickly detects defective parts.

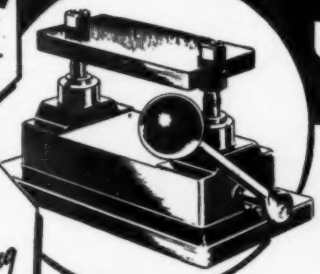
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UNIVERSAL JIG VISE

Build your fixtures around this completely predesigned drill jig body. A real time and money saver. Helps you get into production quicker at lower cost. Savings in time up to 60% not uncommon.

FAST AND EASY TO OPERATE

Lever locks instantly — holds securely. Throw it back and work is released. No complicated adjustments. Saves cost of expensive drill fixtures — only a bushing plate and adaptor needed for each job. Hundreds of Universal Vises now in use saving vital time and money on important war jobs.

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DUPONT RUBBER SAVER

Hundreds of thousands of pounds of crude rubber will be saved and crystal-clear plastic noses and transparent enclosures for military aircraft will flow to assembly lines without interruption because of a new adhesive developed by its Plastics Department, E. I. du Pont de Nemours & Co. announced recently.

Highly-polished, optical surfaces of plastic enclosures must be carefully protected by heavy masking paper against scratching and marring during shipment, fabrication and assembly. Due to critical shortage of crude rubber used in regular cement, development of a less critical substitute was undertaken at request of WPB, Army and Navy.

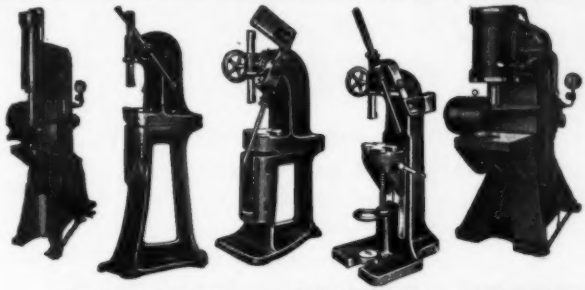
More than one hundred different adhesives, most of them compounded in du Pont laboratories, were tested during the year-long search for a crude rubber replacement. The chemical and physical properties of virtually all synthetic rubber-like materials were examined.

Primarily the adhesive had to seal the protecting paper to the plastic through all handling, shipping, fabricating and assembly because the paper is not stripped off until the bomber or fighter is ready for its initial flight. It had to withstand extremes of temperature and humidity — outdoor assembly lines in California, supply depots in the tropics or the arctic, warehouses in Murmansk, plants in Texas. The paper had to strip off easily, but not self-strip. It could leave no deposit of adhesive, for cleaning takes time.

An adhesive meeting these rigid requirements has now been developed by the Plastics Department of the du Pont Company and approved by the Army and Navy. It is applied to paper by the same equipment previously used for crude rubber cement.

Help Save a Life — Give NOW to the RED CROSS

For AIRCRAFT and MUNITIONS



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GREENERD
The Originators of the Arbor Press
1943

PRECISION WORK IN REARMAMENT

65 Standard Styles and Sizes. Manually operated presses ¼ to 35 tons pressure. Motor driven hydraulic presses 1½ to 30 tons pressure.

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GREENERD ARBOR PRESSES

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Vernon accessories

VERNON 7" ROTARY TABLE

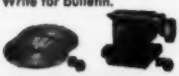


Precision ground top and bottom—Substantially ribbed. 4 table quadrants calibrated 0 to 90° each. Friction loaded worm dial graduated in 240 minutes. Overall height 2¾". Free folder!

VERNON 6" UNIVERSAL INDEX CENTERS

Head swivels and locks from 10° below horizontal to 10° past perpendicular. Spindle taper No. 9B&S. The 3 index plates provided will divide all numbers to 50 and all even numbers to 100 (except 96T) Write for bulletin.





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Vernon Line of HORIZONTAL MILLS, VERTICAL MILLS and JIG BORERS, SHAPERS and GRINDERS



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Grob files are accurate, quality files that remove more stock and cut faster. Get the best—GROB die cutting machines and files.

GROB BROTHERS
GRAFTON WISCONSIN

2 Small Parts Clamped in Exact Positions with De-Sta-Co Toggle Clamps

A difficult arc butt weld job is performed swiftly and accurately through use of two De-Sta-Co Toggle Clamps—the smaller one bolted to the work bar of the larger clamp. Note that because of this unique set-up, there can be no variation in the point of welding. Also that parts can be inserted and withdrawn in minimum time. . . . A simple, inexpensive, time-saving fixture.

For clamping parts in production, use De-Sta-Co Toggle Clamps. . . . Available in all types and sizes. . . . Bulletin No. 43, illustrating many practical uses, sent free on request.



DETROIT STAMPING CO.
Established Over 25 Years
347 Midland Ave • Detroit, Mich.

OLDER WORKERS

More than a third of the total number of persons employed in May were 45 years of age or older, according to the War Manpower Commission. Steady rise in employment among older workers indicates that employers are losing their prejudice against this group and learning to value their experience and "steadiness".

Of the total of 51.2 million persons employed in April of this year, about 37 percent, or 18.8 millions, are of the older group.

The increased use of older workers is not restricted to industries and occupations which traditionally employed older people, but includes all vital war industries and essential civilian services. Workers laid off or retired as beyond the age limit have been reemployed eagerly by employers who investigate productivity and health records rather than birth dates. The skill, experience and judgment of these older men and women have proven invaluable in plants flooded by green workers.

However, says the statement, the older worker must be utilized even more effectively if the 1943 labor requirements of essential industries are to be met.

Older women, he explained, are not being employed as rapidly as older men. Although the employment of older women has increased the figures still represent less than one-fifth of all older women in the country.

Among employed women, the percentage of those aged 45 or over, it is pointed out, has remained constant, something around 22 or 23%. This is not surprising considering the great numbers of younger women who have entered the labor market, but it still indicates poor utilization of a very valuable source of labor supply.

Restrictive hiring specifications, says WMC, still constitute a major barrier to the utilization of older women. As our labor supply dwindles it is becoming increasingly necessary to disregard the age.

—for accuracy and increased production

ERICKSON
PRECISION
COLLET CHUCKS



One Erickson Collet will replace at least 7 standard single purpose collets.

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ERICKSON STEEL CO.
2309 Hamilton Ave.
CLEVELAND, OHIO



Model 201 used in Drill Press. Extra long drills can be used by extending them from the Chuck as they wear.



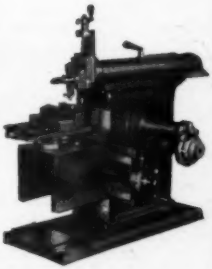
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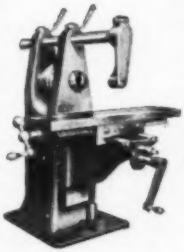
Vertical Milling Operation with Model 101 Chuck.

TWO LOW COST TOOLS

for accurate small parts production!

AMPLE capacity for a wide range of operations . . . ruggedness to withstand today's speeds and feeds . . . and features usually found only on more expensive units . . . enable the Lewis Bench Mill and Lewis 10" Metal Shaper to efficiently handle the smaller jobs in tool room or on production line!





These tools are supplied in semi-finished form — at unusually low cost. All planing, milling, gear cutting, etc., are complete, and only simple lathe, drill press and hand finishing are required. Everything needed for completion is furnished — semi-machined castings, parts and detailed blueprints.

Hundreds of these economical machine tools are now serving on the war production front. Deliveries are prompt . . priority requirements are low. *Send for illustrated catalog describing the complete Lewis line of metal and woodworking tools. Quotations gladly furnished.*

LEWIS MACHINE TOOL CO.

P. O. Box 116, Sta. A, Dept. Z-30, Los Angeles (31), Calif.

AN AMAZING

1/6 H.P.

IN AN ELECTRIC

HANDTOOL

WEIGHING ONLY

35 OZ.



SPEEDS *UNDER LOAD* TO 35,000 R.P.M.

USE IT WITH OR WITHOUT ATTACHABLE COOLFLEX SHAFT

Use PRECISE 35 for grinding, milling, drilling, sharpening, deburring, finishing, and a hundred other ways. Use it on steel of all characteristics, non-ferrous metals up to 350 Brinell hardness, aluminum, plastics and other materials.

Works faster and smoother because PRECISE 35 packs *more power and speed per oz. of weight than any other electric handtool!* Less operating pressure reduces frictional heat—saves wear on cutting tools by as much as 50%. No heating of tool or surface *and guaranteed shockproof without ground wire.* Operates on AC or DC and mounts in stand, vise, or lathe.

Strong, lightweight Bakelite case fits the hand—women hold it long hours without fatigue. Four ball bearings in balanced alignment are sealed in protecting grease chamber. Patented overload switch cuts off current when tool is abused.

For close and difficult work attachable COOLFLEX flexible shaft extends full power and speed of PRECISE 35 to cool-running handpiece weighing only 9 oz. Only PRECISE 35 offers attachable flexible shaft running at 35,000 R.P.M.

WRITE FOR BULLETIN NO. 80

PRECISE PRODUCTS COMPANY
1330 CLARK STREET, RACINE, WISCONSIN

THE PRECISE 35

with the rapid improvement in gunnery and armor. These factors have played an important role in the victories won by the Fleet thus far in the war.

The steam turbine that powers most ships is similar in principle to that which turns the huge generators that supply electric power thruout the country. On land, the steam is generally produced with coal heat, while at sea oil generally is the fuel.

Power plant engineers for many years have been striving for greater and greater economy in the use of fuel and have developed machinery producing remarkable results—turbines operated with high-pressure and high-temperature steam.

These principles now are being employed on American warships where fuel economy is even more important than in land-located electric power stations. In less than a decade the fuel saving on large, modern warships has been increased by as much as 35% in some cases compared with previous installations.

Not only does this result in valuable savings in scarce fuel oil and transportation facilities for such oil, but extends the cruising radius of some vessels by a thousand miles or more and permits them to carry more armament.

Such improvements mean much in war.

MARINE ENGINES IMPROVED

American power plant engineering developments, made during peace time are being adapted to American fighting ships today. These developments are giving them an "edge" over enemy vessels that in many instances means the difference between victory and defeat.

Especially is this true in the matter of fuel consumption. These developments now make possible the propelling of vessels at high rates of speed with the lowest possible fuel consumption. This increased efficiency and speed goes hand in hand

Geared For Victory

Gear Specialists

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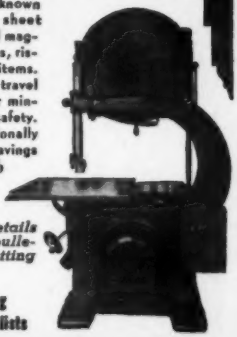
The Taylor Machine Co.

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TANNEWITZ *High Speed* METAL CUTTING BAND SAWS

Fastest and best known means of cutting sheet steel, aluminum and magnesium sprues, gates, risers, and kindred items. Provides saw blade travel of over 2 miles per minute with perfect safety. Cuts are exceptionally smooth. Labor savings ranging from 25% to 90% are the usual thing.



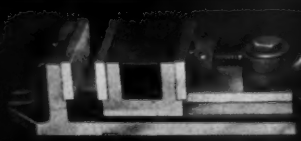
For complete details simply write for bulletin on metal cutting band saws.

Built by Sawing Machinery Specialists

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GRAND RAPIDS, MICHIGAN

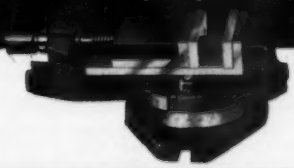
CAM AND SWIVEL VISES

CLEAN
RUGGED
QUICK IN ACTION



CAM VISE . . . Quick acting, clean, rugged in design. Drop forged cam parts; hardened alloy steel screw and handle. Precision built for rapid production work on milling machines. Hardened and ground jaws. Semi-steel castings throughout. Square key slots in base at right angles.

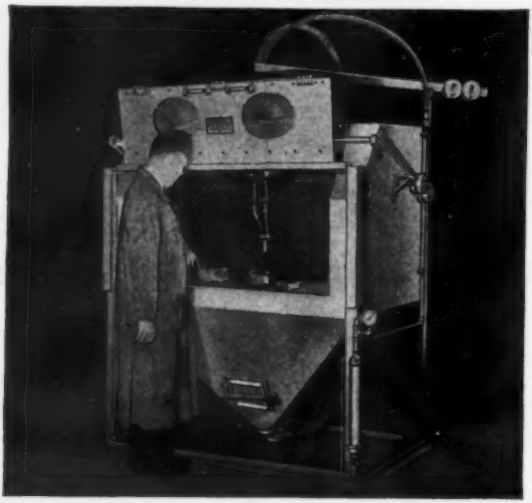
Swivel Vise . . . For Milling Machine, shaper and drill press work. Base graduated in degrees. Precision built. Can be used without base. Hardened alloy steel screw. Hardened and ground jaws. Semi-steel castings throughout. Square key slots in base at right angles. Write for circular.



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For Defense Production!



RUEMELIN Sand Blast Cabinets are very practical for cleaning all kinds of tools and parts after heat treatment. Quickly removes rust and scale. Cabinets are sanitary, furnished complete with dust control apparatus, permitting installation anywhere in the plant. No skilled labor required. Handles sand or steel abrasive. We also build a complete line of blast cleaning rooms, abrasive elevators, welding fume collectors, compressed air dryers. Write for descriptive bulletin.

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RUEMELIN

ENLISTING WOMEN WORKERS

Since Pearl Harbor, American Optical Co., Southbridge, Mass., has lost a considerable number of employees to Uncle Sam. Many of these have been replaced by newly employed people from Southbridge and surrounding towns. However, the local supply of manpower is now practically exhausted, and with the coming draft of AO married workers heroic measures for their replacement had to be devised.

A number of steps were taken to break the employment bottleneck. First, male office employees were asked to volunteer for night work. Among these volunteers, who are being thoroly trained to grind and polish lenses, are sales promotion men, scientists, technical men, clerks, artists, and copywriters who work five hours an evening three days a week. Consensus of opinion among these people is that lens-grinding provides an interesting change from their customary duties.

Next step undertaken by American Optical was the opening in a local trade school of a division to train women in lens production. Such a move, it was felt, would help persuade women with no previous industrial experience to join up for war production.

The course is open to women from 16 to 50. Applicants are paid during the training time which is only long enough to supply basic training for the specific job to be filled. They are shown the numerous operations thru which a molded lens must go before it becomes a finished product. Then the trainees are given specialized training in one of these operations.

To stimulate further interest among Southbridge women in American Optical work, a demonstrating employment office was also opened for three weeks in the heart of the town. This office was expressly created to make factory work more familiar and appealing, and to impress upon women the patriotic service they will render in a war plant.

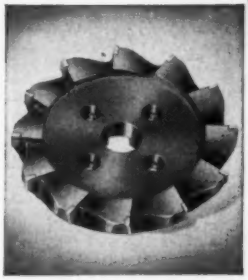
By such means, the firm hopes to train enough women to replace men who will inevitably be called into service during the months to come.

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FOR HIGH PRODUCTION MILLING!



Hyper-mill "Cal-Cutter" with negative rake for machining steel

Specially designed with suitable rake and helix angles for high production milling of steel, cast iron, aluminum, bronze, etc. Standard types of Cal-Cutters with negative or positive rake angles include: Staggered tooth mills, end mills, shell end mills, face mills, hyper mills, heavy duty face mills, adjustable bore-face mills, half side mills, adjustable face and step mills, slitting saws, etc. Special cutters (not listed) made on order.



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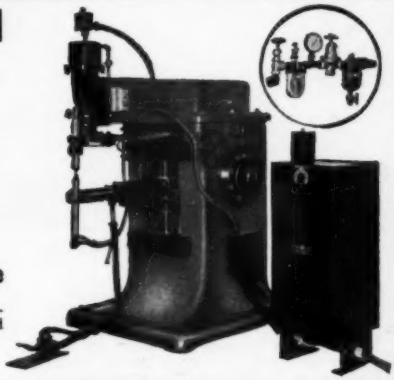
Vernon Line of **HORIZONTAL MILLS, VERTICAL MILLS and JIG BORERS, SHAPERS and GRINDERS**

DESIGNED FOR ALUMINUM AND STAINLESS STEEL

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Spot Welder KT Model Press Type



Made in Voltages to meet Special Requirements where high Amperages and Controlled Pressure are required.

Timing Equipment for Special Jobs.

Air Operated, Oil Lubricated with Air Gauges for controlling pressure.

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For additional information outlining exactly how this new welder will increase your production. Send us complete details regarding your welding problem. These Welders are individually designed to fit your needs.

300-322 Jackson St. **THE TOPEKA FOUNDRY & IRON WORKS CO.,** **Topeka, Kansas**



IMPORTANT PATENT DECISION

A far-reaching decision in a patent suit was handed down by Federal Judge John P. Barnes of Chicago, in favor of defendants, Ex-Cell-O Corp., Detroit, and International Harvester Co., Chicago, June 18.

Brought by W. F. and John Barnes Co., Rockford, Ill., the infringement suit involved 11 patents, with a total of 129 claims in issue, dealing with hydraulic control systems and structures as applied to machine tool operation. It resulted in the longest open court trial of this type on record, beginning September 28, 1942.

Judge Barnes, in a 200-page decision, held that all 11 patents of the W. F. & John Barnes Co. et al were invalid, as to the claims in suit and the decision rendered was in favor of the Ex-Cell-O Corporation.

The decision was proclaimed by machine tool leaders to be as important to their industry as was Henry Ford's successful fight in breaking the Selden automobile patent in the early days of the motor car.

Six of the patents deal with the application of hydraulic power transmission and control means to machine tools.

These six contain claims alleged by plaintiffs to cover such commonly used structures as unitary construction of hydraulic valves for control in machine tool systems; the spring loaded working pressure relief valve for diverting or by-passing a portion of the fluid supplied by the hydraulic pump; an orifice on the discharge side of an actuator for controlling its speed in combination with certain types of diverting valves; self-contained hydraulic units; and the use of one hydraulic pump of relatively large delivery working at a relatively low pressure for obtaining rapid traverse in a machine tool together with a pump of lesser delivery working at a higher pressure for obtaining a feeding speed.

The Job at Hand



for us, it is building accurate, rugged, high-speed counters for the use of industry in its mighty task of equipping our armed forces. For the Machine Tool Industry, it means ever increasing production... and on this front PRODUCTIMETERS provide facts and figures for production control... eliminating waste, saving valuable man-hours.

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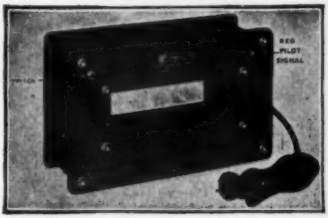
(Above: Model 5-D-1-MF Electric Resetting)

DURANT MANUFACTURING CO.

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A TOOL ROOM NECESSITY



Every tool room needs this simple, portable, sturdy demagnetizer. Small parts passed through the powerful AMC field are instantly demagnetized. Large, flat surfaces can be demagnetized by sliding the device over the surface.

Price is only $32.50, complete as shown.

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ALOFS MFG. CO., Grand Rapids, Mich.



COLMONOY SAVES VITAL METALS

The Pug Knives shown above tell a graphic story of the amazing wear resisting qualities of COLMONOY hard-surfacing alloys and overlay metals.

1. New, 24 lb. pug knife, made of high alloy steel.
2. and 3. Same type, after only 3 months of service. Worn beyond efficient operation, with several pounds of high alloy steel worn away.
4. and 5. Same type. Each blade coated with 1½ lbs. of COLMONOY. In constant use for over a year, and still going strong.

COLMONOY is playing a vital part in the machine tool industry. Use it on parts subject to great wear—lathe centers, dogs, chip breakers, wire straightening shoes, thrust bearings, screw machine fingers and cams, grinder feed fingers, forming and drawing edges, etc.

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720 FISHER BUILDING DETROIT, MICH.

Branch Offices At New York City, Blasdell, N.Y., Chicago, Tulsa, Los Angeles. Other Branches in Canada.



GREATER EFFICIENCY *Round-the-Clock*

Today, when tools must be operated Round-the-Clock, the simple design and dependability of ARO Pneumatic Tools are proving their outstanding superiority on small tool operations such as drilling, grinding, screwdriving, nut-setting and many special applications. Investigate ARO. Write for catalog. Ask ARO Field Engineers to help solve your *special* tool problems.

THE ARO EQUIP. CORP. ARO BRYAN, OHIO

PNEUMATIC TOOLS

VACATION TRAVEL

Employees in all branches of business and industry have been asked by ODT to intensify intramural programs enlisting cooperation with the government "Don't Travel" campaign.

To keep passenger trains and intercity buses clear for necessary travel, ODT requested that employers and department heads who have not already done so arrange to spread their vacation periods and those of their employees throughout the year instead of concentrating them in the summer. They were further asked to scrap the normal practice of starting and ending vacations at the weekend and to draw up schedules permitting employees to leave and return on Tuesday, Wednesday or Thursday.

The following pointers for civilians, summing up government policy on travel under wartime conditions should be emphasized wherever possible:

1. Don't travel unless the trip is absolutely necessary.
2. Vacation at home or as near home as possible.
3. Take the full vacation at one time instead of spreading it over weekends.
4. Don't make quick overnight trips.
5. Start and end vacation travel on Tuesday, Wednesday or Thursday, when travel is lightest.
6. Stay at one vacation spot; don't make side excursions involving use of trains or buses.
7. If travel to the vacation site continues through meal periods, take a box lunch.
8. Travel "light." Check heavy baggage through to destination.
9. Make plans flexible enough to allow for last-minute changes due to travel contingencies such as missed connections, reservation sell-outs, etc.
10. Be prepared for delayed arrivals, crowded conditions and lack of usual comforts.
11. Do not plan to commute to and from nearby resorts.

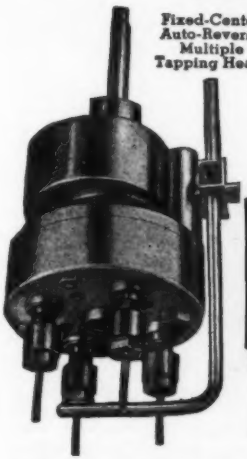
Unnecessary travel by civilians for the duration, the ODT stressed, includes trips to other cities to visit friends, trips home for the weekend, sightseeing jaunts and tours to amusement and sport centers.

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ERRINGTON MECHANICAL LABORATORY

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Fixed-Center Auto-Reverse Multiple Tapping Heads

ADJUSTABLE MULTIPLE SPINDLE DRILLING HEAD

All Parts Fully Enclosed to Insure Pressure Lubrication and Rigid Support of Adjustable Spindles



Super-Sensitive Fixed-Center Multiple Drilling Heads

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GOOD DELIVERY

For economical polishing, lapping or finishing of gears, shafts, dies, gages, ball races, long rods, etc.

Built to meet the requirements of those desiring a heavy constructed, smooth running machine of highest quality.

Has large built in motor with variable speed control, using REEVES standard pulley and belt.

Smooth automatic brakes act instantly when switch is thrown. Collets or chuck may be used.



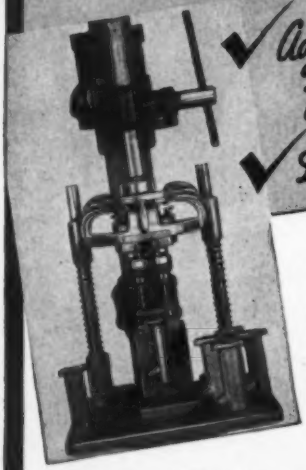
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BUILDERS SINCE 1879

157 Division St. Chicago, Ill.

TWO SPINDLE
Adjustable
DRILL HEADS
Drill Two Holes At Once



✓ *Adjustable Centers from ½" to 6"*
✓ *Drill Capacity 0" to 5/8"*

Sleeve and overarm types . . . in several sizes. Will double output of any single spindle drill press.

Quickly adjusted to desired drill centers from ½" to 6".

Send for bulletin.

LINDERME MACHINE & TOOL CO., INC.
12253 COYLE AVE., DETROIT, MICH.

STEEL SCRAP SEGREGATION

All compliance powers available to the WPB will be used to enforce its order requiring segregation of alloy steel scrap, which was reissued recently with revised categories covering recently-developed alloy steels and irons.

Steel Division officials pointed out that the country's stocks of virgin alloying metals are being rapidly depleted, and that a considerable tonnage of valuable alloys which could supplement new supplies is being dissipated because of improper segregation and identification.

Order M-24-c, which requires the segregation of alloy scrap, has been in effect for about a year, but many producers, dealers, and steel mills have failed to fully comply with the order. Much of the available alloy steel scrap — containing invaluable elements such as nickel, molybdenum and chromium—is not finding its way back to the furnaces as alloy scrap.

The re-issued order's revised classifications, it is expected, will make segregation easier, and if adhered to, will add a large supply of alloys for use in steel production. Letters sent by the Steel Division to producers of iron and steel, to users, and to scrap dealers urge fullest cooperation to prevent the necessity of large-scale compliance actions by WPB.

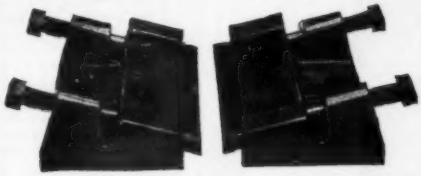
Steel mills and foundries have also been asked to initiate at once a continuing survey of receipts of scrap, particularly carbon and alloy turnings, and to report any incorrectly classified receipts including car number, shipper, date, and analysis to the Scrap Section of the Steel Division.

In addition to providing for the proper segregation of the various types of alloy scrap, the revised M-24-c specifically prohibits use of any type of scrap listed in the melting of any but alloy steel or iron.

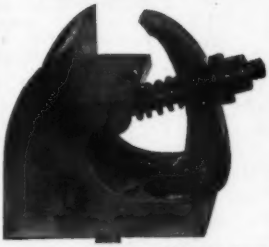
* * * *

GIVE NOW
to the
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HART'S Divided Machine Vises



These Vises will hold work the full length of the table, if necessary. Useful on planer, milling machine, surface grinder or drill. They adapt themselves to any shape and can be used on sides of table as well as ends. The jaws are tool steel and hardened, the angle holding the work down on the table.

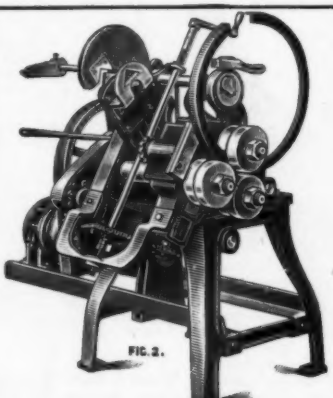


HART'S Milling Fixtures

These fixtures will make themselves popular and profitable in your shop. Easily kept clean to receive the work. May be used in either horizontal or vertical position. Suitable to hold round, hexagonal, octagonal, or square stock, aligning the work with the machine. Grip holds the work on the bottom as well as on the back. Shipped in pairs, unless otherwise ordered. Made in 4 sizes—$\frac{3}{4}$" to 4".

HART MACHINE CO.
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No. 14 Angle Rolling Machine

HERE IS A
Machine
THAT HAS FOUND ITS WAY INTO
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CAPACITY—2"x2"x¼" ANGLE

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SPEED WAR WORK

by magnetically removing metallic particles, suspended in oil. Prolong tool life, protect machines and improve finish. Indispensable for gun boring, reaming and rifling machines, and the manufacture of steel cartridge cases. Frantz permanent magnet Ferro Filters are available in sizes to meet your requirements. They soon pay for themselves and show a profit. Catalog on request. S. G. Frantz Co., Inc., 161 Grand Street, New York, N.Y.

FRANTZ FERRO FILTERS

MOVIE FIGHTS ABSENTEEISM

"This Too Is Sabotage", a 25-minute sound film dramatizing importance of well-balanced meals to America's health, has been produced by the Westinghouse Electric & Mfg. Co., to aid in the nation-wide fight against industrial absenteeism, and as a contribution to the national nutrition program.

Based on health statistics provided by government and other authoritative agencies, the picture shows that proper eating habits for war workers play a vital role in combatting absenteeism and preventing the fatigue that causes many industrial accidents. Scenes illustrate that the use of properly-balanced meals based on the government-recommended seven essential food groups may help reduce the 150 million man-days of work that estimates indicate will be lost during the next four months because of accidents.

One part of the movie shows homemakers banding together in nutrition clubs to study relationship between food and health and the necessity of serving war workers and children health-building meals that contain essential vitamins and minerals. This part of the picture was based on the Health for Victory nutrition program launched 16 months ago and now used by more than 1,116 war plants and other organizations. Production was supervised by Mrs. Julia Kiene, Director, Westinghouse Home Economics Inst., and founder of the Health for Victory plan, and J. Gilbert Baird, director of the company's Visual Education Section.

Filming was by Roland Reed Productions at the RKO-Pathe Studios, in Hollywood and features a cast of motion picture actors headed by Wynn Gibson. War plants, schools, women's clubs, civic organizations, rural groups and nutrition meetings write Westinghouse Visual Education Section, Mansfield, Ohio. State choice of at least two dates. Both 16 and 36-millimeter prints are available.

BALDOR
BALL BEARING **GRINDERS**

A Complete Line

for every grinding job



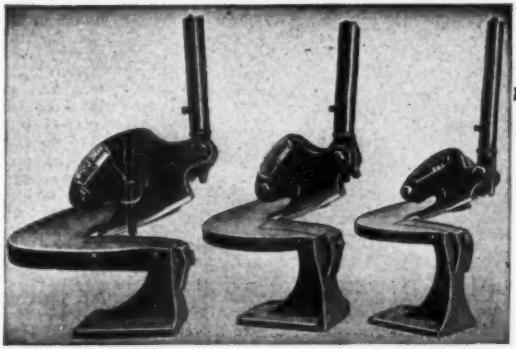
AT LEFT: Special Carbide Tool Grinder for quickly and accurately sharpening Carbide Tools. ½ HP ball-bearing motor.
6" x 1" wheels. **$95.00**



AT RIGHT: Baldor Pedestal Grinder No. 121; 2 HP motor; 12"x2" wheels **$205.60**

ASK FOR BULLETINS

BALDOR ELECTRIC COMPANY 4368 Duncan Ave., St. Louis, Mo.



Get BEVERLY Throatless SHEARS

SAVE TIME ON WAR ORDERS!

If you're cutting straights or irregulars on War orders you can speed 'em up with a BEVERLY Bench-Type Shear. Order No. 1 for 14 Ga., No. 2 for 10 Ga., No. 3 for 3/16" mild steel and 10 ga., stainless.

BEVERLY SHEAR CO., 3005 W. 110th Pl., Chicago, Ill.



corner of the plate. In this way, any variation in plate size itself will not be carried into troublesome variations between centers.

One little jig boring machine has cross table travel of 6" and a 12" longitudinal. It has a quill arranged for slow hand feed, and is very convenient for jobs falling within its scope. Larger machines are built for larger work by other firms. One outstanding manufacturer of radial drills also includes a very good jig borer in his line of machines, which has a cross travel for the table of 17½". On these machines, the longitudinal table travel may be either 30 or 42", as desired. In duplicating of parts without jigs or fixtures, these machines offer the best way out that can be found.

Some years ago, a leading machine tool importer in this country took over the sales of a highly accurate jig borer made in Switzerland. It had more the general appearance of a metal-working planer than a standard jig boring machine. On this tool, the table had adjustment longitudinally, and the boring spindle had adjustment in a cross-wise direction. It was claimed that with this machine, hole diameters were held to limits of .0005", and center distances to .00025". I do not know whether this machine is at present available. It is definitely known, however, that there are at least two manufacturers of jig borers in this country who use a dial gage and inside micrometer system on their machines.

JIG BORERS

While the first and most definite use of the jig borer is drilling and reaming or drilling and boring holes in jig plates to receive drill bushings, it is also adaptable for small lot production, experimental work, etc.

In boring a plate, it is wise to make a layout of the boring on a drawing, so that a blue print can be furnished the jig borer operator. To insure accuracy between hole centers, machine one edge and one side of the plate square. Do all dimensioning of holes in both directions from the included or fully machined

BUY U. S. WAR SAVINGS BONDS AND STAMPS

ABSENTEEISM

We may anticipate that "absenteeism" will get worse before it gets better. For the simple reason that, as more and more "marginal" workers — 'teen age youths, women, older persons and those with physical handicaps—come into the field of industrial production, they may be expected to aggravate a situation which already is regarded in many quarters as critical.

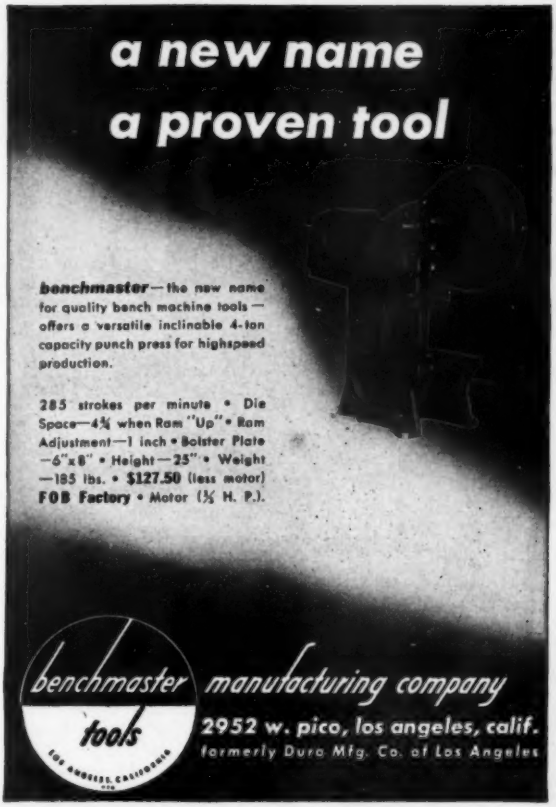
These classes of workers will bring with them their own peculiar sets of absenteeism - causing conditions, among them lower stamina, family difficulties and greater accident proneness. We can count on man-days being lost, too, by these groups for the same capricious causes which are estimated to have cost the war effort 35,000,000 man-hours last year, thru "willful" or "voluntary" absenteeism.

If we accept the hypothesis outlined above, what steps can industrial management take to prepare itself for the problems ahead?

For one thing, plant operators will be obliged to continue, even expand, their efforts toward reducing voluntary absenteeism. Whatever form these may have taken in the past—morale-building plant meetings, payroll enclosures, shop posters, etc.—they will be necessary more than ever before to keep work attendance up and production running. Changes in the strategy and direction of these programs should probably be made to meet the changed audience at which they are directed. Thus, a working group consisting largely of women with families would be better addressed on the subject of time taken off for shopping rather than of pay-day "jags".

Unquestionably the biggest opportunity confronting industrial management is to reduce both voluntary and involuntary absenteeism by adopting and instituting simple, inexpensive health and safety measures in industrial plants and by educating both regular and "marginal" workers in proper health and accident-prevention practices for their off-the-job hours.

Much is being done toward this end by various agencies working on the problem; and while considerable progress has been made, still greater effort is needed.





PLASTICS IN AIRCRAFT

Plastics are being developed for aircraft manufacture which perform the same functions as aluminum, save weight, cost less, and are proving better than the corresponding metal parts, W. I. Beach, Chief Plastics Engineer, North American Aviation, Inc., Inglewood, Cal., told the semi-annual meeting of ASME in Los Angeles.

Describing a plastic forming process developed by North American's engineers, he said a method of treating thermosetting laminated material was discovered which, contrary to the thermosetting concept, permits forming of objects having simple and compound curvatures.

According to all definitions of phenol - formaldehyde plastics, the material when finally cured under heat and pressure becomes infusible and insoluble. It was believed that the final product of 'C' stage material could not be adapted to a forming or bending process, in view of the fact that thermosetting plastics were irreversible and would not soften or plasticize.

This theory is erroneous in so far as it applied to the phenolic laminated sheet material manufactured today, said Beach. The fact that an apparent thermosetting product can be formed indicates that complete polymerization or cure has not taken place. This is borne out by an actual case wherein a test specimen was formed and reformed twelve consecutive times.

The aircraft industry being essentially metal fabricators finds it difficult to think in terms of plastics.

Analogy is drawn herein between plastic laminates and the aluminum alloys. Both materials exhibit similar forming properties. In the case of SO Aluminum which has 8% elongation in 2", a right angle bend or draw is accomplished by a corresponding sliding of the crystals through the slip planes. There are 3 separate slip planes or axes present in the crystalline structure of aluminum which allow freedom of forming in any plane.

IMMEDIATE SHIPMENT!



STEEL BOXES

for your Production Needs

STACKING BOXES

An ideal all-purpose shop box. Sturdy all-welded construction. Heavy skids act as a positive stacking lock and re-inforce box at point of maximum wear.

No. 601—10"x16"x8"—18 Gauge.....$ .95
No. 602—12"x18"x8"—16 Gauge..... 1.25

Prices F.O.B. Factory, Philadelphia—Any Quantity!
Order Today—Write, Wire or Phone

AMERICAN METAL WORKS, INC.

1502 Germantown Avenue **Philadelphia, Pa.**

BIG PUSH CALLS FOR STEEL

Scrap faster — Win sooner!

With Axis morale sinking faster under every bombing . . . with the fortress of Europe cracking ahead of schedule . . . we're setting up the Axis for the final hay-maker!

That means an advance behind a curtain of shrieking steel . . . continuous barrages blasting our enemies round-the-clock until they say Uncle!

The Time Is Now

So our war planners have flashed an urgent message to *keep the steel coming.* And remember, half of the huge production will be scrap. Will we make it? Of course we will!

Be Wise—Organize!

So *organize* your scrap drive . . . make it a continuous operation . . . in charge of a square-jawed executive with authority to keep it rolling!

And segregate your steel types, wherever possible, according to alloys and grades. It will save time all along the line . . . get your steel into the fight faster!

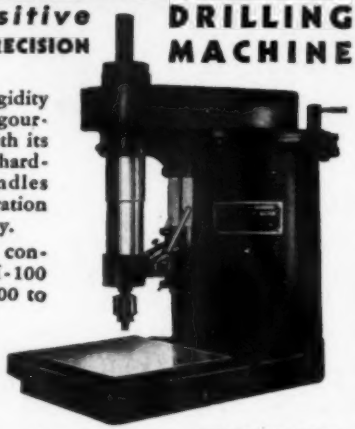
BUSINESS PRESS INDUSTRIAL SCRAP COMMITTEE

Room 1310, 50 Rockefeller Plaza, N. Y. C.

If you have done a successful salvage job at your plant, send details and pictures to this magazine. Send for Primer of Industrial Scrap to help you tackle the Salvage Problem.

SIGOURNEY M-100

EXTREMELY *Sensitive* DRILLING MACHINE
TO MEET CLOSE PRECISION REQUIREMENTS



The strength and rigidity of this newest model Sigourney drilling machine with its sealed ball bearings and hardened and ground spindles insure high speed operation with maintained accuracy.

For critical work on continuous schedules the M-100 may be operated at 4,000 to 10,000 R.P.M. . . . with full safety provided by complete enclosure of all moving parts except chuck and drill.

Multiple spindle machines, individually motor driven, are also available in 2, 3 and 4 spindle models. The use of rising blocks extends the range of work while the easy accessibility of driving belt and pulleys make speed changes a matter of seconds.

PROMPT SHIPMENTS TO QUALIFIED BUYERS



Send for detailed bulletin and prices. The Sigourney Tool Co., Hartford 6, Conn.

Sole Sales Agents

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Division Niles-Bement-Pond Co. - - - West Hartford, Connecticut

BEST ENGINEERS TO WIN WAR

Because of the importance of making the fullest possible use of available resources, the side with the best engineering will win the war, L. A. Umansky, Assistant Manager of General Electric's Industrial Engineering Department, said in an address before the Northeastern New York War Production Conference, Schenectady, N. Y.

"The real meaning of the word 'engineering' is making the most skillful and efficient use of the available materials and of human effort," Umansky said. "The foremost job of engineers is, therefore, to conserve our critical materials which can be done in the following three ways: By use of alternate materials more readily available; by working available materials harder; and by using available materials more skillfully. All three methods or a combination of them is being actually used by engineers in furthering the war effort.

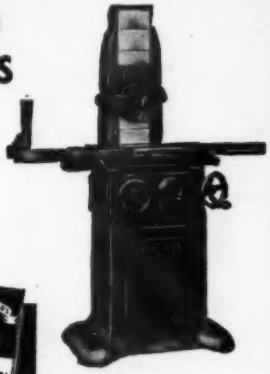
As an example of skillful engineering, intended to conserve our natural resources, Mr. Umansky cited the method of connecting airplane engines under test to a generator and pumping energy which would otherwise be wasted back into the power system. At several engine factories, up to 60 % of the energy required to operate the entire plant is thus obtained and if all airplane engines were tested in this way, approximately 750,000 tons less coal would have to be mined and transported annually, he added.

"No effort should be wasted on anything that will not help win this war," he said. "However, this does not mean that engineering developments and investigations should be stopped during the war. On the contrary, they should be stimulated, since this war, more than any other in history, is a war of machines, of engineering.



TOO CLOSE? YEA, MAN!
but...SURFACE GRINDING
has got to be CLOSE to be GOOD!

REID GRINDERS



Are working in nearly every war production plant in America . . . Grinding vital work, quickly and accurately.

MODEL 2-C HANDFEED SHOWN IS RECOMMENDED FOR FINE TOOL ROOM WORK.

Send for Catalog and Moderate Prices

Leading Dealers Everywhere.



REID BROTHERS CO. INC.
BEVERLY, MASSACHUSETTS

SAVE TIME ON INTRICATE **ANGULAR SET-UPS . . .**

MULTI-SWIVEL VISE



Fully universal . . . three swivels simplify the setting of compound angles. Parts interchangeable . . . can be used as a plain flanged vise, a swivel vise or multi-swivel vise.

The Platen greatly increases the capacity of the unit. Vise and Platen are interchangeable.



WRITE FOR INFORMATION

MASTER TOOL CO.
161 HIGH STREET • BOSTON MASS.

Unmatched Features . . . Many Found Only In Big Machines!

in this Fine New

PORTER-CABLE 7" SHAPER



LOOK AT THEM

6 automatic feeds, either direction.
Table traverse 10½". Vertical travel 5½". by handwheel.
Ram travels in dovetail ways; phosphor bronze slide block.
From 64 to 175 reciprocations per min. by Air-Speed Control.
Micro-Set adjusts stopping point exactly.
Tool head turns 360°; has tapered locating pin.
Heavy crank-pin plate gives flywheel action.
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Table mounted on dovetail.
Large, heavy-ribbed vise; tapered locating pin.
Steel and cast-iron parts.

This fast-cutting versatile shaper is built for lots of hard work! Make heavy cuts—no fear of chatter, backlash, or work misalignment. Get faster set-up, greater precision, easier operation. It's got the weight, stamina and power for doing many jobs now swamping your big units! Ask your local Porter-Cable man for complete details, or write us today!

PORTER-CABLE MACHINE CO., 300-8 Exchange St., Syracuse, N.Y.

EYES AND EARS OF BATTLE

Production of electrical instruments—"eyes and ears" of American battle equipment—has soared to the highest point in 55 years at the Westinghouse Meter Division, Newark, N. J., the firm reports. Pointing out that specific figures could not be released, it is said output has exceeded all expectations and continues to rise.

This increased production became necessary in order to equip the thousands of mechanized war weapons being built for the Army and Navy. For example, a modern battleship may require as many as 850 instruments. By measuring volts, amperes, ohms or watts, electrical instruments in planes, ships and tanks keep their crews informed at all times concerning internal operating conditions.

Thousands of instruments are being supplied for Army and Navy communications equipment—from giant transmitters to the portable "walkie - talkie" radio sets that are carried by soldiers on their backs. Other specially designed instruments help gunners, tell an airplane pilot if he's "on the beam", and register electrical phenomena for Navy research men.

Since one average bomber alone requires more than 50 instruments to guide the pilot, navigator and radio operators, Tom Turner, Division Manager, explained, America's air forces are among the chief users of instruments.

Protection for Navy and cargo ships against magnetic mines is provided by so-called degaussing apparatus operated with aid of current-measuring instruments. The strong magnetic field set up automatically by a ship's steel hull makes it in effect a huge magnet that will attract and set off floating magnetic mines sowed by enemy aircraft. The magnetic force of the ship is counteracted.

NEW BOOKLET *Describes* LIGHTWAVE MEASUREMENT

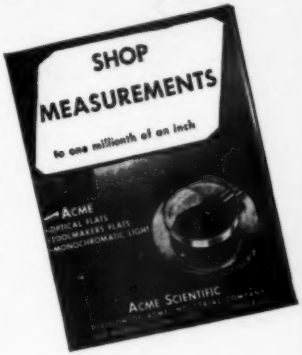
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IT'S YOURS FOR THE ASKING!

Just off the press. . . Acme's new booklet "SHOP MEASUREMENTS to one millionth of an inch," describes in simple detail how Acme Optical Flats are applied in the procedure of lightwave measurement.

Illustrations and diagrams show how these flats can be used to check surface flatness, as well as their use for accurate comparison measurement in connection with precision gage blocks.

In short, this new booklet has been written in non-technical terms to make it easy for the average mechanic to thoroughly understand how to apply lightwave measurement in shop practice.



Write for Your Copy Today!

ACME INDUSTRIAL CO.

Makers of Standardized Jig and Fixture Bushings

210 N. Leflin St. MONroe 4122 Chicago, Ill.

SEE This Easy Way of Cutting Sheet Metal!

GES-12 ELECTRIC HAND SHEAR



BIG CAPACITY

A powerful tool that makes quick work of cutting sheet metal. Cuts 6½ feet of ⅛" boiler plate per minute. Shears 14 gauge stainless steel.

Even Cuts Curves

Ideal also on curves of even small radius. Cutting edge always visible. Easy to control. Weighs only 12 lbs.

WRITE FOR LITERATURE

Jefferson Engineering & Mfg. Co.

269 Walker Detroit, Mich.



IT'S PRECISION THAT COUNTS!

This war has again proved our contention that — **it's precision that counts!** There can be no compromise with accuracy, especially in socket products.
Our complete "CHICAGO *Safety Plus*" line of socket products are not only **accurate,** but they are **tough** and **strong.** They are being used by American Industry in winning the war!

ARMY (E) NAVY

★
Order from your distributor
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THE CHICAGO SCREW CO.
ESTABLISHED 1872
1026 So. Homan Avenue Chicago, Ill.

COPPER RECOVERY

Extent of WPB's copper recovery program in aiding the nation's war industries is shown by the fact that to date 197 million lbs. of "idle and excessive" copper, both in primary and fabricated forms, have been allocated for war use.

The amount, WPB announced, represents two-thirds of all copper thus far reported under the program. Of the remaining 100 million lbs reported, approximately 36 million are assembled products contaminated with materials not suitable for copper scrap. Arrangements for the movement of the balance are currently being made at Copper Recovery Corp.

Original estimates were that "idle and excessive" copper to be recovered ranged from 400 to 500 million lbs. So far, 114-000 firms have been approached in connection with the recovery program. Plans are under way now to reach 98,000 plumbers, building contractors and their suppliers.

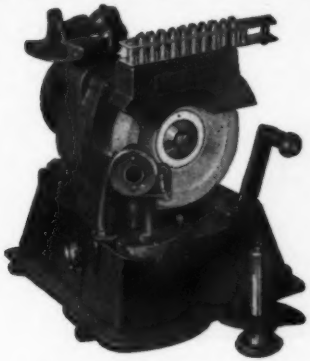
Of the amount already allocated, 62 million lbs are fabricated copper and copper-base alloy. Thirty million lbs have been directed into the regular scrap market, 56 million lbs have been sold for use in present form, and 93½ million lbs have been allocated for remelting. The remaining 17 million lbs have been retained by owners for production.

A substantial majority of owners of copper have agreed to sell idle material for remelting for war use at the special Government prices which are well above scrap prices.

A ten-point code of practical suggestions to aid patriotic advertisers in compliance with WPB orders requiring approximately one-half reduction from prewar standards in the use of zinc and copper for publication purposes has been compiled by "The Committee of Fifteen", Crosscup-Pishon Post No. 281 (Advertising Men of Boston) The American Legion, and distributed with the co-operation of The Advertising Club of Boston and allied organizations.

Salvage all the copper you can.

WHY WASTE SKILLED LABOR ON DRILL GRINDING! WHEN ANYONE CAN SHARPEN SMALL DRILLS WITH A



BLACK DIAMOND
PRECISION DRILL GRINDER

High priced skilled labor used on grinding drills is costly because any apprentice, with a single Black Diamond machine, can produce quantities of precision ground, small gauge and fractional drills with—lips of uniform length—correct angle and proper clearance. And the Web Thinning attachment grinds Notched—Colton or Crank Shaft Points just as efficiently.

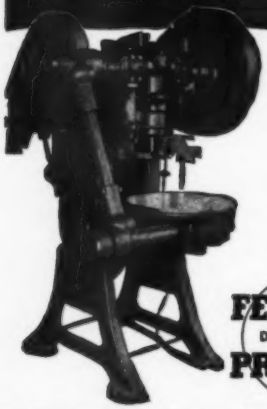
If you use small drills, singly or in gangs—save valuable war production time and labor by installing a Black Diamond Drill Grinder at once.

Write for full details.

BLACK DIAMOND SAW & MACHINE WORKS, INC.
45 NORTH AVENUE NATICK, MASSACHUSETTS







By high speed staking of radio switch sections on Federal Dial Feed Presses, "ears for the army" are speeded to completion at P. R. Mallory and Co. Federal Open-Back, Inclinable Presses are performing similarly specialized work in hundreds of war plants. Write for literature.

FEDERAL DIAL FEED PRESSES

THE FEDERAL PRESS CO., 808 DIVISION ST., ELKHART, INDIANA

WOMEN ON PRECISION WORK

Pioneers in an intensive application of the policy of employing "women" for production of precision cutting tools, Archer & Smith, Ltd., (formerly Hub Tool Company), Lexington, Ky., report that they are more than satisfied with this type of specially trained tool makers.

When Archer and Smith established their company in Lexington, key men from their Detroit plant organized training courses to assure the specialized skill required of every employee involved in producing their cutting tools. The company quickly got into full war production, concentrating on precision cutting tools for the aircraft industry, on a 3-shift, 24-hour day basis.

Under direction of highly skilled men, practically all the operating employees are women, all of whom have taken an intensive training course at the plant, under actual production conditions, and have been "graduated" to precision tool work only as they attained the required proficiency. Production men, engineers, draftsmen, superintendents, foremen and setup men are selected men of exceptional skill and experience.

Aided by modern equipment which reduces physical effort by the operator to a minimum and permits closest control of all precision operations, these skill-trained women tool maker-ettes have proved highly successful. High quality precision standards have consistently been maintained, volume has been thoroughly satisfactory, absenteeism has not been a problem, and the "all women" policy has been an outstanding contribution to the war effort, solving a manpower problem in a very practical manner.

Several hundred skilled women are now employed in the operations and plans for further expansion are under way.

Victory is counting heavily on women.

Off the Floor Deliveries!

ON

TRINDL SUPER INDUSTRIAL ARC WELDER

DESIGNED FOR HIGH SPEED PRODUCTION ARC WELDING

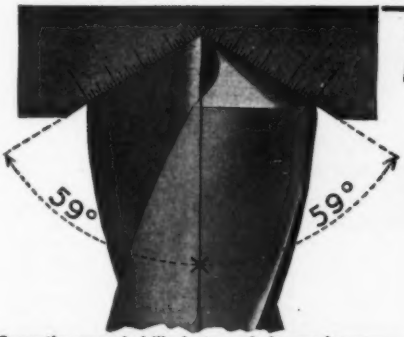


TRINDL SUPER INDUSTRIAL ARC WELDERS, the result of many years of careful engineering and "job tested" research, are rolling up impressive production records. Acclaimed for superior performance, ruggedness, dependability, and economical operation. For better, faster welding, easy-to-operate TRINDL SUPER INDUSTRIAL ARC WELDERS will help step up your production schedules 20% to 40%. Manufactured in a range of distinctive sizes to accommodate every type of shop and production welding job. Trindl Welders, Electrodes, supplies and accessories, available for immediate delivery, will save you both time and money.

Write, wire or phone for full details

TRINDL PRODUCTS, LTD.

2227-AT CALUMET AVE.
CHICAGO, ILL.



Correctly ground drills last much longer because—
(1) They drill more holes per grind.
(2) Less of drill ground away than by free hand.
(3) Each lip cuts same amount.
(4) Less chance of breakage.
(5) Drills will be ground when necessary if a HISEY Drill Grinder is available.

HISEY Drill Grinders (Bench and Pedestal) types made in 4 sizes for grinding drills from No. 60 to 2½ inches, all kinds.

TROUBLE GETTING DRILLS?

Have that trouble less often!



EXPERIENCE NOT REQUIRED

Hisey THE HISEY-WOLF MACHINE CO. CINCINNATI, OHIO

WRITE FOR CATALOG 60KH

Unparalleled
POWER

¼ H. P.
at 50,000 R.P.M.
Without
HEAT, NOISE
or VIBRATION



The Onsrud MD-1 Grinder gives small grinding wheels and cutters the surface speeds at which they work best. These higher spindle speeds permit the use of coarser grit wheels and result therefore in faster cutting. Features which make this versatile tool so economical and efficient on many time- and labor-consuming jobs include: cool-running air turbine motor which cannot be damaged by overloading; controlled, automatic spindle lubrication; total weight of only 31 ounces.

If you use small tools for die-grinding, drilling, milling, routing or internal grinding, it will pay you to write today for full details on the MD-1.

ONSRUD MACHINE WORKS, INC.
3908 Palmer Street Chicago, Illinois

Onsrud
AIR TURBINE and HIGH CYCLE
TOOLS and MACHINES
Routing · Drilling · Shaping · Grinding · Milling

SCRAP IDENTIFICATION

The U. S. Navy has developed a color chart and tag system as a method of identifying various types of scrap metal.

A color chart furnished to all activities producing ferrous and non-ferrous scrap outlines the system of identification used for in-stock metals.

A tag is placed on the machine indicating the metal alloy being processed. When the machine needs cleaning or when a change is made in the type of metal being machined, a flag is placed on it for immediate attention of the sweeper. The sweeper fills the tote box and then transfers identification tag from the machine to the tote box. The tote box is taken to the containers and put in the one marked by the identical color circle found on the tag. Containers should be sufficient in number to hold all scrap produced.

The greatest possibility of error lies in the transfer of scrap from machines to containers. If proper containers are not available or supervision is lax, many mistakes will be made to nullify the whole effort. Success is dependent on proper supervision and responsibility. This will have to be worked out in ways best suited to individual activities.

Available facilities can be used to transport the containers to the scrap yard. Transportation should be organized on a definite schedule with due consideration for times when scrap may be produced faster than is usual.

The salvage yard will have bins, closed or open, marked by colored circles to indicate the containers to be emptied therein. The empty containers can be placed back on the yard truck and returned to the shop when full ones are collected.

The yard arrangement should be such as to permit fast and easy handling of the various grades of scrap as it comes in. Bins should be large and plainly marked. Construction should be such as to permit oil and moisture drainings that will not sludge up the driveways, Space should be kept open near the ferrous piles to permit work by burners and sorters.

We make them Sturdier!

INDUSTRIAL DIAMOND TOOLS FOR EVERY USE

Today's war production conditions created a new problem: Over-use and frequent abuse by inexperienced help demanded greater ruggedness... Diamond Tools that stand up and take it.

Two generations of experience helped solve this problem. We invite you to put Molina Diamond Tools to the test.



No. 520 — Multiple points for finer dressing and precision finish. Used with fast dressing traverse.



Radius Diamond Tool for J. & L. Thread Grinder. Various other tools for radius dressing available.



Two Abused Diamond Tools

Holders ground away, subjecting diamonds to friction and loosening. Only Molina's sturdier construction kept diamonds in holders.

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MOLINA

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MOLINA INDUSTRIAL DIAMOND CO. OF U.S. - 31 W. 47TH ST., NEW YORK, N.Y.



How to End Distortion Spoilage . . !

USE A VISE WITH ADJUSTABLE PRESSURE

Injury to parts as a result of faulty clamping in milling and drilling operations can be avoided by using a Presto-Vise instead of an ordinary vise. This is because the jaw pressure of the Presto-Vise can be adjusted according to the softness or hardness of the metal that is being clamped.

The Presto-Vise also speeds up operations tremendously because of its quick action. A single movement of a lever causes the sliding jaw to travel from "closed" to "open", or vice versa. And its large jaw opening (4½") makes it easy to get the parts quickly in and out of the vise.

Widely used in tool rooms as well as for precision work. Special attachments make it quickly convertible into an adjustable drill jig.

Free CATALOG

PRESTO-VISE

D. A. SMITH & CO.
8087 Livernois, Detroit, Mich.



Pratt Grinding Gauges caliper external cylindrical jobs while work is in motion or at rest. Adapted to straight or tapered work. Tolerances of .0001" plus or minus easily maintained. Visible check on out of roundness, rough grinding and chatter. Cannot grind work undersize unknowingly. Easily installed on any grinder. Pratt Grinding Gauges increase production, eliminate scrap and assure accuracy. A modern precision tool, ruggedly built.

Send for Bulletin

American
DIAMOND TOOL & GAUGE CO.
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OIL GROOVING

Methods used for oil grooving vary considerably in different plants. Cases seem to be on the increase in which tools that cut by pressure are used in modern arbor presses. You may be familiar with the fact that broaching and keyway cutting are done in this way, without having thought of oil grooving. It is a fact, however, that one builder of pneumatic arbor presses has recommended his machines for oil grooving.

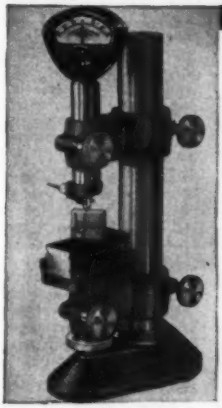
Where there is much work to be oil grooved, it is better to have machines on the job designed for this purpose quite small. However, fairly large numbers of manufacturers employ these machines for long runs with equal success, especially in the handling of shafts, connecting rods, retaining rings, universal joints and similar parts. The machines can be used for grooving large, irregular workpieces either internally or externally. When the cutting tool has reached the proper depth, the feed lever automatically returns to neutral position..

Where parts to be grooved run large in size, a horizontal type of oil groover is often used in which the workpiece is held in a large, non-rotating chuck at one end of the machine. At the other end of the machine a pair of ways, reciprocates a massive tool head. An arm extending from this tool-head carries the grooving tool. The chuck will hold work of odd sizes and shapes, and since it does not revolve, no problem of balance is involved. Bearings as large as 20" in diameter and 22" long may be grooved by using this type of machine.

So called continuous oil groovers are also furnished by the firm making the horizontal oil groover already mentioned. This type of machine is adapted for the handling of smaller work, and is especially good where much oil grooving is to be done, and where the lots of material to be grooved are

* * * * *

Don't forget the AMERICAN RED CROSS. give generously to their cause.



Made in 4 SIZES

MIKROKATOR "MIKRO" (MINUTE)
FRICTIONLESS AMPLIFICATION

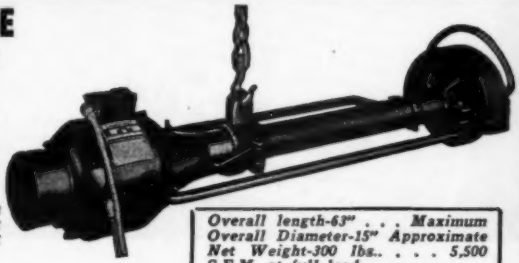
RAPID
RELIABLE
SENSITIVE
LIGHT
COMPACT
STURDY

Complete elimination of friction, lag, and backlash insures positive, dependable repeat readings. Pointer responds instantly to the slightest movement of measuring tip; no swinging past true reading, no waiting for pointer to come to rest. No lights or electro magnets, no warm-up period required. No electrical connections, can be readily moved to different locations. GRADUATED: .0001" to .00001"; .001 mm to .0002 mm.

SWEDISH GAGE CO., OF AMERICA
8900 ALPINE AVE.. DETROIT 4, MICH.

The MARSCHKE "In Between" Swing Frame GRINDER

It fits admirably between the small flexible shaft machines and large swing frame grinders



Overall length-63" . . . Maximum
Overall Diameter-15" Approximate
Net Weight-300 lbs.. . . . 5,500
S.F.M. at full load. .. ..

The direct motor-drive-ball-bearing construction lets the wheel get full use of the 3 HP, 1800 RPM motor. Placement of handles enables operator to supply two-handed pressure for maximum cutting from 12" x 2" wheel. Its combination of balance, swivel collar suspension and light weight enables operator to angle machine to any desired position and apply wheel to every exposed surface on all sizes and shapes of castings and is equally desirable and efficient for reducing seam weld of large plate, tank and structural work.

★ **The MARSCHKE LINE** ★

Manufactured by the

VONNEGUT MOULDER CORP.

1805 Madison Ave.
Indianapolis, Ind.



ELECTRONICS

Radar, recently-disclosed "6th sense" weapon for United Nations fighting men, is among wartime electronic devices which will safeguard civilian life in peacetime.

This was the prediction of A. C. Monteith, manager, Industry Engineering Dept., Westinghouse Electric & Mfg. Co., in a speech before the New York Institute of Finance.

Radar, Monteith explained, tracks down enemy plane positions with the speed of light by means of invisible beams of radio short waves which pierce fog, rain, darkness and rebound earthward to be picked up by a Radar receiver. The same principle, he said, can be used to detect obstacles in the path of planes, and ships, preventing crashes.

Importance of Radar as a military weapon is illustrated, said Monteith, by the fact that the Westinghouse has increased 41 times its output of Radar equipment and other communication apparatus for military use, since 1940.

"We are investigating the peacetime possibilities of Radar in industry," the engineering executive said in the fifth of a series of electronics speeches heard by the Institute.

Just as Radar is helping to win the war, other electronic devices are helping industry to win the battle of production, Monteith said.

These devices employ tubes ranging in size from tiny photo cells of glass to the large metallic "can" types used in Ignitron rectifiers. "Tubes are the focal part of the electronics industry but they are a small part of it," said Monteith. "Circuits necessary to apply these tubes," he added, "will run four to 200 times the price of the tubes themselves."

The Ignitron converts alternating current electricity to the direct current needed for the "mining" of magnesium from sea water, and for the manufacture of magnesium and aluminum by electrochemical processes. Mr. Monteith noted that "electricity is as necessary as bauxite in the production of aluminum today. Ignitrons are one of the keys to the manufacturing process."



PROMPT DELIVERY—Essential Tools Today because they save hours of time, prevent costly breakage and long shut downs. STEELGRIP Standard Rigid Arm Gear and Wheel Pullers are of improved design. Will not slip from work. Arms are forged and heat-treated. 2-arm, 3-arm and special models. 12 types and sizes. CHAINGRIP Universal Pullers pull wheels, solid gears, pinions, etc., even at considerable distance from end of shaft. Proof-tested chains have both chain hooks and special pulley hooks. 3-ton and 12-ton capacities. *Write for Catalog Sheets.*

ARMSTRONG-BRAY & CO.
"The Belt Lacing People"
5364 Northwest Highway, Chicago, U. S. A.

PRACTICAL DESIGN
PRECISION WORK
PROMPT DELIVERY

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DIES

DeMOSS—recognized specialists in the design and construction of DIES.

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AT YOUR SERVICE ! !

W. S. DE MOSS & SON
660 VIRGINIA AVE. . . .
INDIANAPOLIS INDIANA

NEED GOOD COOLANT PUMPS?



BRADY-PENROD MODEL 7500 Centrifugal coolant pump and tank—a neat, compact unit highly suitable for use where abrasives are a factor.

Good pumps PAY. Buy the kind used as *standard equipment by many leading machine tool manufacturers*—BRADY-PENROD. Model 7500, shown above, is one of a complete line designed to meet every need. It handles all coolant liquids—kerosene, solubles, light and medium oils, etc., 4 to 100 g.p.m. Tank sizes, 6, 15, 30 gal. or larger, with as many hoses and nozzles as required. Discharge pipe is cast integral with pump and brought to outside of tank. The hinged cover allows cleaning without disconnecting return line.

All BRADY-PENROD pumps have heavy-duty, standard construction NEMA motors, ⅛ to 1 H.P., any current, phase, cycle.

Brady-Penrod
Incorporated
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New DATA

on
OILSEALS and
GREASEALS

for
Aircraft and
Motorized Units



This NEW BULLETIN . . . .

gives you the latest information, recommendations, diagrams, listings, prices, etc., on the broad line of Gits Oilseals and Greaseals, which are widely used in today's mechanized warfare. They provide positive bearing protection under all conditions. Your FREE copy is ready for mailing—write for it.

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1860 South Kilbourn Ave. Chicago, Ill.

30 years of oil cup experience

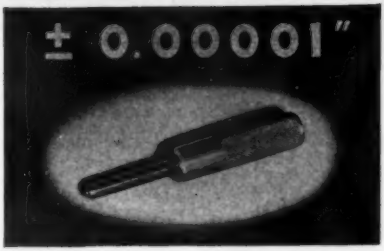
POST WAR

Despite tremendous war-plant construction program of the past three years and despite anticipated post-war surplus-plant problem, F. W. Dodge Corp., New York, anticipates larger volume of industrial plant construction during the 10 years following the war than in the 1930-'39 decade. Estimated increase of the post-war decade over the pre-war decade is about 30%, in terms of 1940 dollars.

Expectation is based upon currently accumulating deferred demand for new plant capacity in unexpanded civilian-goods industries: food products, paper and pulp, printing and publishing, stone, glass and clay products, textiles, refrigerators and cold storage, lumber and woodworking, leather and leatherworking, railroad shops, etc. In spite of greatly increased demands for their products, this group of non-war industries has shown a declining volume of new plant construction since October 1941, when first restrictions were placed upon non-essential civilian construction of all kinds. The decline from 1941 to '42 was 31%. In peacetime, through prosperity and depressions, this non-war industry group invests 50% more annually in new plant facilities than does the war industry group, says the firm.

Analysis of war plant construction of 1941, '42 and '43 indicated that about three eighths of the total, measured in dollar value, represents new capacity for chemicals and allied products (exclusive of ammunition and explosives), petroleum refining, iron and steel, nonferrous metals and their products, etc. These, according to Government figures, are not necessarily beyond peacetime needs.

The other five eighths of the war-plant program, made up of facilities for aircraft, aircraft engines, parts and accessories, ship construction and ammunition is stated to be clearly beyond peacetime needs, says the statement, recently issued by this well-known firm.



GET TUNGSTEN ALLOY'S PRICES ON THESE PRODUCTS

Tamaloy Carbide Tips • Tipped Tools
Tipped Lathe Centers • Tipped Drills
Gages • Speedaloy Tool Bits

THIS EXTREMELY ACCURATE GAGE WAS BUILT TO ORDER BY TUNGSTEN ALLOY

The tungsten carbide gage shown in small scale, is typical of special tools made to superlative accuracy by Tungsten Alloy. It is used to check the races of aircraft-engine bearings . . . is dead true on center and has a diameter tolerance of one one-hundred-thousandth of an inch. It takes good equipment and good men to do that. Why not let these machines and these craftsmen make your tools and gages?

Bulletins on Request

TUNGSTEN ALLOY MFG. CO.

65 COLDEN STREET, NEWARK 4, N. J. formerly Circle Tip Tool Co.

STURTEVANT QUALITY

Permanently Accurate

Torque Wrenches



A Complete Line

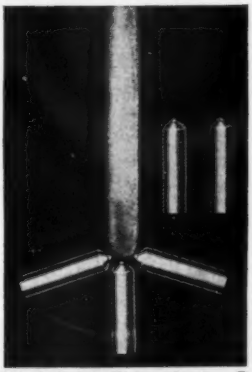
of permanently accurate measuring and gauging wrenches that are standard in leading war plants for gauging and controlling torque in production and for testing and measuring in inspection. Indestructible taper beam construction. Double scale visible from all working angles. Capacities from 0 to 7200 inch pounds.

NO Friction Adjustments Moving Parts Fragile Mechanisms

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A NEW VISE!

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All-Angle
VISE



EXCLUSIVE DRIV-WHEEL MOVEMENT
gives 2⅛ inch lateral clearance

DOUBLE SWIVEL CONSTRUCTION
permits any conceivable horizontal position

RIGHT ANGLE CLEARANCE
allows perpendicular position without base obstruction

POSITIVE HORIZONTAL SETTING
meets 180 degree setting with highest accuracy

3 HIGHLY LEGIBLE PROTRACTOR DIALS

SPECIFICATIONS
- Hardened and ground replaceable jaws
- Double base
- 7/16" slots for T bolts
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- 2 wrenches, bolts, nuts and washers furnished.

No.	Width of Jaw	Depth of Jaw	Jaws Open	Height with Vise Horizontal	Net Weight Lbs.	Price F.O.B. Chicago
V735	3⅛"	1¼"	2⅛"	4⅝"	14	$79.50
V745	4⅛"	1⅝"	3¼"	5"	15½	99.50
V760	6"	2"	4"	8"	46	149.50

Order Today — by wire, phone or mail

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423 West Superior St. Chicago

HAND STONING

Most of us do not fully appreciate the advantages obtained from the practice of consistent hand stoning of various metal-working tools and cutters.

A cutter that has been properly ground looks and feels quite sharp, but the fact is that when the edges are examined under a magnifying glass, they are very rough indeed as compared with edges that have been hand stoned. When you remember that the rate at which a cutter dulls increases progressively, you will appreciate that the better edges obtained by hand stoning will far more than pay for the stones and the effort involved.

Further, when the cutters have begun to dull, they can be readily touched up again with a suitable set of hand stones or so-called abrasive files. This can be done without in any way disturbing a machine setup, a factor of great importance in many cases. It follows that even on a relatively short run, judicious use of abrasive files may easily save tearing down a setup for one or more grindings.

Lathe tools, milling machine cutters, drills, shaping and planing tools all show much better results when they are handstoned conconsistently. Naturally, cutters of many different types present many different problems in getting to the edges effectively with an abrasive file. Because this is true, foremost makers of these tools provide them in various sizes and shapes. Because such stoning saves many grindings, tool life is greatly lengthened, and precious tool steel is conserved. Greater production speed is also obtained due to the more efficient edges maintained on the cutting units.

Most abrasive files are of even sectional size from one end to the other, though there are a number that are tapered and pointed. The latter afford access to tight corners. Some have a stone only ⅛" square, and come in the form of a pencil which can be sharpened down to the stone, thus protecting the delicate abrasive member. Some of the straight models to be had include sectional shapes that are square, triangular, round, flat, bevel-edged, diamond-shaped, oval, and knife-blade forms.

Have you sent for a FREE SAMPLE of the NEW

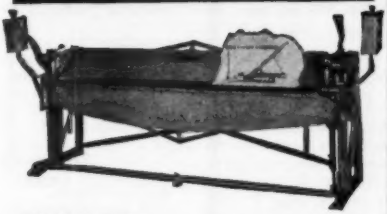
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Speeds layout time on brass, aluminum, copper, tin, stainless steel. Oil resistant. Won't chip, crack, or flake off. Comes in handy 8 oz. bench type brush-in cans. Also pts., qts., gals., drums. Write —

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ROLLER BEARING BRAKES

Roller bearings at important points make them faster, easier working. Combination type for box and pan as well as all kinds of straight bending. Made in 4-5-6-8-10 ft. sizes and 12, 14, or 16 ga. capacity.

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Industry's New Tool . . .
Mead Burring Machine

It is a time, labor and money saver on innumerable jobs in any shop. Sharpens tools, cutters, etc., of many kinds. Prompt shipment.

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CLEANS motors and machinery faster! Blows out dust, dirt, lint, etc. Prevents blowouts and breakdowns. Can be converted for use as Sprayer or Vacuum Cleaner. Powerful. Portable.

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Precision Authenticators



ELECTRIX Gages authenticate precision production to within .00005 of absolute. Their *known* accuracy inspires confidence on the part of precision-workers.

If gages of questionable accuracy are causing production difficulties in your plant, let us know. We are applying all of our Engineering skill and experience to the Victory effort. And, to meet your specific requirements

we shall be glad to cooperate in developing for you the instruments in which we specialize — 33 diversified types of gages; also jigs, fixtures and form tools.

GO PRECISION AUTHENTICATORS NO-GO

ELECTRIX Corporation

Peace-time engineers of soft-rubber connectors for electrically-operated equipment

150 MIDDLE ST., PAWTUCKET, R. I.

SUPERVISION

A foreman can get along without the sentimental regard of his employees—but not without their respect, says M. C. Thomsen, comptroller, Bodine Electric Co., Chicago, in Executives Service Bulletin. To get respect, he must give it.

Confidence is born of confidence. The supervisor who has confidence in his men and respects them will be trusted, in turn and will earn their confidence. Moreover, the supervisor who wants respect from others must have respect for himself.

One of the best ways for a supervisor to show the men that he respects them is to let them see that he is protecting their interests. Each employee knows that to a degree his interests are in the hands of the foreman, so when he fends for them they will have confidence in him.

Another way to show respect for the men is to make no promises without keeping them. One of the best ways to insult a man is to forget to keep even one promise. Another consideration just as disruptive appears when an employee entrusts a personal matter to his foreman, only to find it revealed to others, perhaps thoughtlessly.

If the supervisor is to deserve the confidence so indispensable to his own job, he must demonstrate complete knowledge of the work done by his subordinates.

Without that capacity he cannot properly perform his administrative duties. Failing in this he loses the confidence of his men as a direct result of the inevitable lack of confidence in himself. A similar reaction appears when a foreman assigns a job to a man and then denies him the privilege of taking the responsibility for its performance. The implied lack of mutual confidence and respect makes trouble.

An important measure of a supervisor's self-respect is his loyalty to the company which employs him. If he is not loyal to his own supervisors and to his organization, he cannot expect his men to be loyal to him.

Save TIME and MONEY

WITH THE

"BLANER" Universal Hand SPRING WINDER



Every shop and tool room needs it . . . a strong, dependable unit . . . quickly set up in any vise.

Increases production of hundreds of sizes of springs.

Write for illustrated folder, giving complete details

THE JOHN BLANER COMPANY
Corner Meek & Elm Sts.
SHARON PENNSYLVANIA

HYBCO TAP GRINDERS



For Sharpening

CHAMFER - FLUTES - SPIRAL POINTS

CAPACITIES:

Machine Screws to 1½" hand taps.

Can be arranged for any number of flutes —right or left hand.

ALL TAPS HELD BY SHANK.

Can be sharpened after center is destroyed.

Write for catalog—and send us your problem.

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1279 W. 3rd St. Cleveland, Ohio

New

INSPECTOR'S STAMPS



Faster Identification of Inspectors or Operators. Different borders may be used for different shifts. Available in 4 sizes. Write for prices today.

NEW METHOD STEEL STAMPS, Inc.
145 JOS. CAMPAU DETROIT, U. S. A.

MADE OF ALLOY STEEL
MILLED FROM BAR

SOCKET HEAD
CAP SCREWS



SAFETY HOLLOW
SET SCREWS

Try Them On Your Next Job!

ECONOMY
MACHINE PRODUCTS
COMPANY

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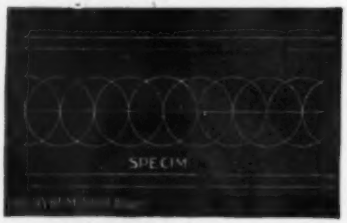
UNUSUAL ACCURACY



This is a new Jansson vernier height gage, especially designed for use in jig and fixture making, as well as for general layout and inspection work in war production or other precision-operations.

Exceptional precision is claimed, making it a valuable adjunct to gage blocks in angle measurement and other operations demanding high accuracy. Three standard sizes are available, 12, 18, 24", English or Metric measure, say the makers, Jansson Gage Co., 19220 Glendale Ave., Detroit, Mich.

Buy U. S. War Savings Bonds



DYKEM STEEL BLUE
STOPS LOSSES
making dies & templates

Simply brush on, right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

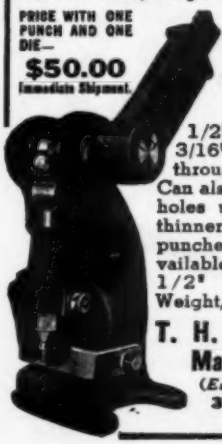
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BENCH PUNCH

Built for hard, tough work—die cannot lose alignment with punch — all parts interchangeable.

PRICE WITH ONE PUNCH AND ONE DIE—
$50.00
Immediate Shipment.



Capacity — 1/2" holes through 3/16" steel; 13/32" through 1/4" steel. Can also be made for holes up to 7/8" in thinner metal. Stock punches and dies available from 1/16" to 1/2" by 64ths. Weight, 70 lbs.

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(*Est. 1890*)
311 E. 47th St.,
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★ ★ Equip Your Shop with These Time-Saving Economy Tools

NICHOLSON EXPANDING MANDRELS



TYPE A—STEP JAW DESIGN

Especially adapted for holding work with short bores while being machined between centers on lathes, grinders, millers, shapers, etc.

No.	Range of Bores Taken	Net Price
1A	½" to 1"	$12.00
2A	1" to 1½"	16.00
3A	1½" to 2"	23.00
4A	2" to 3"	34.00
5A	3" to 4"	40.00

(Other Sizes Taking Up to 7" Bores) Hardened tool steel, accurately ground. Sold singly or in sets. Prompt delivery. Write for bulletin.



TYPE B—STRAIGHT JAW DESIGN

Adapted for work with both short and long bores.

No.	Range of Bores Taken	Net Price
1x	⅛" to 9/16"	$10.00
2x	9/16" to 21/32"	11.00
3x	21/32" to ¾"	12.00
00	¾" to ⅞"	14.00
0	⅞" to 1"	16.00
1	1" to 1¼"	18.00
2	1¼" to 1-9/16"	21.00
3	1-9/16" to 2"	29.00
4	2" to 2½"	40.00

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SHOVEL TRUCKS



MADE BY

POLLARD BROS.

THEY HAVE THE PERFECT BALANCE

WORKS LIKE A SHOVEL

Push the Truck Under the Load

Twist Truck and Load Is Off

CAPACITY—
500 LBS. PLUS

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SAFE HANDLING

WIDE CURVED HANDLE PROTECTS HANDS
WILL NOT TIP OVER WHEN PLACED IN AISLE



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FENN

QUICK ACTION VISES

These work-tested, quick-action vises have demonstrated their capacity for fast dependable service for over twenty years.

On jobs where there are milling, drilling, tapping, and assembling operations — where a rugged, high-speed vise is required — that is where the Fenn finds its place.

Send for Bulletin No. 10.

THE FENN MFG. CO.
HARTFORD, CONN.
ESTABLISHED 1900

INFINITE SPEED VARIATION



Said to result from exhaustive research in power control and transmission is this latest drive by Powermatic Machine Co., 659 S. Anderson St., Los Angeles.

Installed in any position or location common to standard electric motors, it is said to have the advantages of a standard electric motor and a standard "V" belt drive, plus: controlled power, low speed high-torque position starting, shockless acceleration, correct belt tension (at all speed settings) and preset control. Positive belt alignment, accurate speed regulation, elimination of motor overload and reduced operator fatigue are further advantages claimed.

Fully detailed literature is now available, the firm reports.

THE WOUNDED CAN'T WAIT— GIVE TO THE RED CROSS!

WE INVITE YOU TO TRY

CRATEX
WHEELS AND POINTS

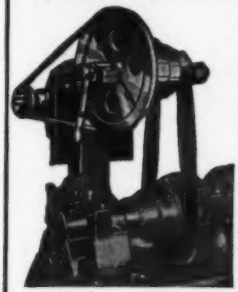
The World's Best Rubberized abrasives for Fine Grinding and Polishing

Attach this advertisement to your card or letterhead. We will send you a *free* trial sample. Or if you prefer send $1.00 for Special 33 wheel assortment.

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STEEGE MOTOR DRIVES FOR DEFENSE GUARANTEED FOR FIVE YEARS

No chance of breakdown, doing a good job powering machines for defense production. No noise, floating cone, results 100% power. 8 years of production proof of durability. Easily installed.



PRICED AT $40. AND UP. FOR LATHES, SHAPERS, MILLERS, ETC. IMMEDIATE DELIVERY. *Send for descriptive pamphlet.*

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Heavy Duty
Live Centers

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Adapted for heavy duty work. Precision type ball and roller bearings assure maximum capacity for high speed production and long service.

NIELSEN, INC. LAWTON, MICH.



"E" TO UNIVERSAL FOR OUTSTANDING ACHIEVEMENT IN THE MANUFACTURE OF VITAL TOOLS

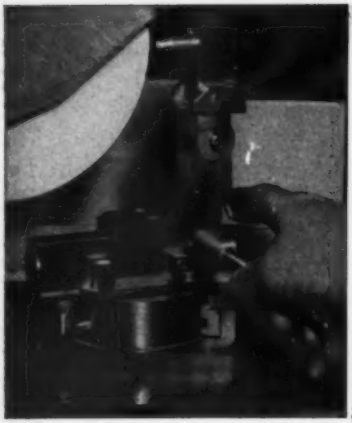
We are proud to announce that we have been awarded the coveted Army-Navy "E" in recognition of the quality and quantity of the Universal precision parts we have been producing for the war effort.

You can improve your jig operations with Universal Drill Bushings. They are straight and round and have super-finished bores for accuracy and long life. Write for complete catalog.



UNIVERSAL ENGINEERING CO.
FRANKENMUTH MICHIGAN

A RADII & ANGLE DRESSER
OF PRECISION AND VERSATILITY



An instrument of precision and versatility . . . Operation is simple requiring no high degree of skill for accuracy . . . Any one of the following can be produced with one setting:

One angle

Two angles

Concave radii up to 6"

Convex radii up to 4½"

Two Angles and radius.

Many other diversified forms to meet requirements.

Wheel size capacity—9" dia; angular travel 3"; for use on universal surface and cylindrical grinders.

Full details available on request.

MANUFACTURED BY
J & S TOOL CO. 477 Main St., East Orange, N. J.
PRECISION DRESSING TOOLS

REYNOLDS COOLANT SYSTEMS



Three improved Coolant Systems for machine tools have recently been designed by the Reynolds Machinery Co., Providence, R.I. They include Coolant System 2-S with an approximate 12-gal. capacity, and a geared pump. It is not equipped with a tank. Driven by a ½ hp motor it is intended for use on Milling and Screw Machines, Lathes and Machines using Coolant and Cutting oils. Three models include the 110 volt single phase, 220 volt 3 phase and 550 volt 3 phase types.

Illustrated is System No. 1-S of approximately 7 gal. capacity with a 16x10x11" tank and a geared pump and ¼ hp motor. It is also designed for Milling and Screw Machines, Lathes and Machines using Coolant and Cutting oils. 110 volt 1 phase, 220 volt 3 phase and 550 volt 3 phase models are manufactured.

No. 206 has approximately a 15-gal. capacity, a tank size of 20x16x16" and a rotary pump driven by a ¼ hp motor. It is designed for use on Grinding Machines, Multiple Spindle Drills and Machinery using water and soluble oil solutions. Three models are made for 110 volts 1 phase, 220 volts 3 phase and 550 volts 3 phase.

LATHE TRAINING FILMS

Complete information on two apprentice training films, "The Metal Working Lathe" and "Plain Turning", is contained in a new, four-color circular, No. 8-A These 16 m m full color sound films are supplied on a free loan basis to war plants and schools for training new lathe operators.

They are based on the book—"How to Run a Lathe", a best seller among technical books. They show what a lathe is for, how it operates, the principal lathe operations, and application of these operations on a representative job. Use of the films in training new operators, supplements instructional work, reduces personal supervision, and helps reduce errors thru an effective presentation of correct lathe practices.

Circular contains complete descriptions of the films and detailed information on how they can be obtained. Copies can be obtained by writing to South Bend Lathe Works, South Bend, Ind.



MASTER REPAIRMAN—Ernst Brandt (left) puts the finishing touches on the dynamic balance of a small steam turbine in General Electric's New York Service Shop, while Charles Schleicher assists. Brandt has handled every phase of repair work in the shop, and has developed a number of machines to improve and speed up emergency service.

INSULATED BUSHINGS

The general line of insulated bushings and mountings (designed to stop vibration, absorb shock and reduce wear) that are now available with rubber, rubber reclaim or synthetics as the insulating medium is described in a new folder and engineering data sheet just issued by Bushings Inc., 3442 West 11 Mile Road, Berkley, Mich.

The folder illustrates the method of manufacturing bushings while the data sheet, which shows the cross sections of some 30 of the more typical types of insulated bushings, forms a convenient reference list for the designing engineer.

PRECISE "35" BULLETIN

Plugging in anywhere, running practically without vibration, developing 1/6 hp at load speeds from 20,000 to 35,000 rpm, a little hand tool, the Precise "35" (MTBB, Sept. '42, p. 296) tailed in an impressive bulletin just released. Coolflex flexible shaft attachments for the tool are also detailed.

Said to be unique among tools of its kind, it is claimed to pierce metals with drills up to ⅛" diam., write on glass, metals and plastics with pencil ease, and, in lathe tool-posts, grind internally and externally.

Address Precise Products Corp., 715 Racine St., Racine Wis.

Let's buy BONDS and own a share in our final VICTORY.

Produce with **SAFETY!**

It pays to protect your operators by equipping your presses with

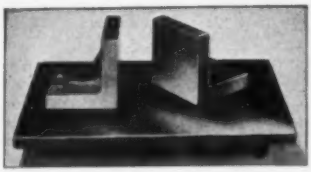
STRAND Enclosure Safguards

Easily installed. Adjustable to any size die. Quickly changed for any set-up. Available with or without Transparent Shield. Write for circular.

STRAND MFG. CO., INC.

158 N. Desplaines St., Dept. H Chicago 6, Ill.





ANGLE IRONS

ACCURATE to .002" in 6"

For setting up work, tools and fixtures on Boring Mills, Planers and Grinders. For aligning tools or work on milling machines. For lining up drilling operations on drill press. Regularly used in conjunction with Bench and Surface Plates.

Dimensions	Net Price Each
2"x 2"x 2"	$ 3.00
3"x 3"x 3"	4.00
4"x 4"x 4"	4.75
5"x 5"x 5"	9.25
6"x 6"x 6"	12.25
8"x 8"x 8"	19.25
8"x10"x12"	28.00
12"x12"x12"	39.50

SURFACE PLATES

Ground Accurate To .002" From Flat

For laying out work on the bench, mounting bench lathes, assembling and inspection departments or providing a flat working surface.

Dimensions	Net Price Each
12" x 12"	$18.00
10" x 15"	20.00
12" x 18"	22.00

Prices F.O.B. N. Y. C.

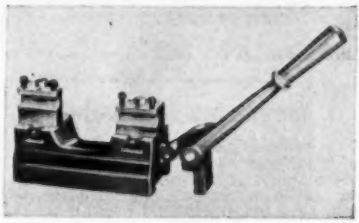
Please Send for Our Catalogue on Complete Machine Shop Supplies.

SID TOOL CO.
177 Mulberry St.
NEW YORK, N. Y.

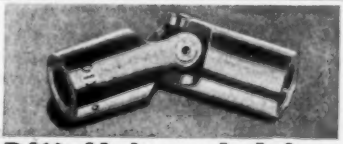
AERO COLLET CLOSING ATTACHMENT

Two new accessories that are claimed to convert most small and medium size engine lathes into the speed range of hand production screw machines are announced by the Kessler Aero Products Co., 211 W. Palm Ave., Burbank, Cal.

The Aero quick-acting Collet Closing Attachment handles accurate duplicate work on bar and tubing stock from 1/32" up to and including ½" diameter by chucking and releasing work while lathe is running. This is claimed to save 75% of production time by this particular operation.



The Aero lever-type Cross Slide used in conjunction with the Collet Closer provides for forming and fast cut-off. Both attachments may be easily assembled without machine work or interference with normal operation of the lathe. It is recommended for Atlas, Craftsman, South Bend, Logan and similar lathes of ¾" spindle capacity. Both items are fully adjustable. Manufacturer states that immediate deliveries can be made.



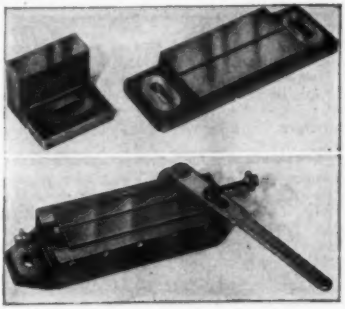
DIX Universal Joints

Precision made in 15 standard sizes, or to customers specifications. Write, wire for detail data.

DIX MANUFACTURING COMPANY — PRECISION MADE PRODUCTS

ROUSE FIXTURE SET-UPS

In order to make the Rouse Hand Miller fully productive on short notice and at minimum cost, the manufacturer has made available several fixture set-ups. These set-ups eliminate the need for most of the preliminary tooling usually necessary in making the completed fixtures.



Illustrated is an Angle plate Set-up, with a 3/16" Keyway on the bottom surface; a Flat Set-up with 3/16" Keyway on bottom and 3/16" Keyway on top, giving adjustment from front to back, and sideways. The bottom illustration shows a stationary Base Plate with Sliding Table. The base plate has 3/16" keyway on the bottom. The sliding table has adjustable stops at both ends and a movement of 3½" with a lever feed. The movement can be adjusted from left to right.

Complete information may be obtained from H. B. Rouse & Company, 2218 N. Wayne Ave., Chicago, Ill.

UNITED OFFERS TURRET ATTACHMENT

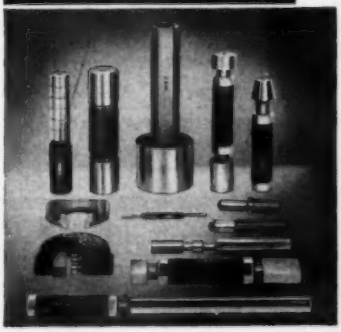
A six-station turret attachment that quickly converts an engine lathe into a hand screw machine has been placed on the market recently by United Industries, 4 E. Buena Vista Ave., Detroit, Mich.

It is made in a variety of models to fit any size and make of engine lathe, (10, 12, 14, and 16" and is installed on the ways simply by removing the tail-stock. The base, which clamps to the lathe bed, is normalized and machined to withstand heavy production schedules. All gears and racks are fabricated from alloy steels, and are of standard design, facilitating replacements.

HUNDREDS OF GAUGES

STANDARD PLAIN
CYLINDRICAL PLUG BLANKS
Prepared for final finish
Waiting for your orders

SEVEN DAYS DELIVERY ★ ★



ALSO OTHER TYPES OF GAUGES
PLUG:
Taper, Square, Progressive, Wire, Flush Pin, etc., etc.
SNAP:
Solid Flat, Built-Up and Adjustable Limit, Mod. "A" and "C"
All made to Standards or Drawings
ORDINARY OR HARD CHROMIUM PLATED
REASONABLE DELIVERY

MIDDLESEX
GAUGE AND TOOL CORPORATION
526 W. 48th Street, New York, New York
Hard Chromium Plate Salvaging of Worn Plug Gauges Saves Steel, Machining and Men—Let us refurbish them for you
QUOTATIONS AND LITERATURE ON REQUEST

QUALITY CUTTERS

The Standard of QUALITY

All standard sizes carried in stock for immediate delivery. Special cutters made to Blue Print.

As Cutter Specialists since 1919 we are able to offer the highest *quality* and *service* at *attractive prices.*

Write today for prices. *Few Territories Open.*

QUALITY TOOL WORKS
Market St., Waukegan, Illinois

EUTECTIC WELDING FOLDERS

Low-temperature welding rods, for welds which bind without melting base metal, are informatively detailed and illustrated in new folder by Eutectic Welding Alloys, 40 Worth St., New York.

Rods are detailed for welding cast iron, nickel, Monel, steel, aluminum, (sheets, shapes, tubes, cast, and alloys) copper, bronze, brass, magnesium (and alloys). In addition, there are rods recommended for salvaging worn machine parts. Back page of the folder describes various advantages claimed for the method, with illustrations of practical on-the-job applications.

Much of this data, is also done up on a vest-pocket-sized, celluloid card which operators and executives should find handy.

Another folder goes exhaustively into salvaging tools. It is designed as a poster, to be hung up in the shop, and goes into salvage of broken broaches, cutters, form tools, reamers, etc., with a section entitled "Making Milling Cutters From Scrap Metals".

Every Bond you buy today will help speed Victory!



Transfer Points Insure Accurate Layouts In Die Making

A real helping hand! Heimann Transfer Screws are quick, accurate markers in setting dies. No wrench needed. Six hardened screws nested in holder (see below). Uniform height hex base to point, insuring clear uniform indentations. *Send for circular.*

PRICES Per Set	
3/16"	$1.50
1/4"	1.20
5/16"	1.25
3/8"	1.35
7/16"	1.40
1/2"	1.50

All U.S.F. Also S.A.E.



HEIMANN MFG. CO.,
URBANA, OHIO

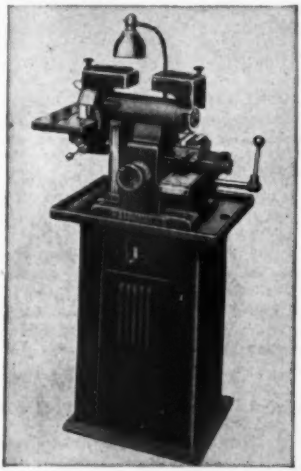


V-BELT CARBIDE GRINDERS

Finer chip breaker and cup-wheel precision grinding are among the features claimed for 2 new, v-belted, 4-B and 6-B model Carbide Tool Grinders, announced by Hammond Machinery Builders, 1614 Douglas Ave., Kalamazoo, Mich.

Model 4-B, illustrated, shows the multi v-belt drive. With it, there are no electrical specification limitations. The drive also provides smooth operation—the V-belt dampening motor vibrations.

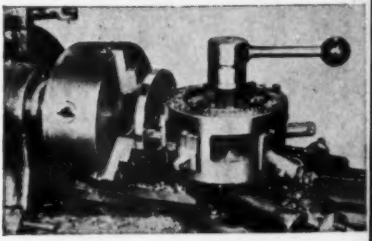
Chip breaker side, (right) of the machine, provides precision tool setting and accurate groove grinding with a diamond wheel. Smooth, vibrationless, 4-B is equipped with ball-bearing spindle and oversize bearings, permanently grease-sealed. Brake provided quickly stops wheels when reversing on single phase current.



Drip feed tanks with adjustable valves for diamond wheel grinding are integral parts of wheel construction and accommodate either 4" or 6" diameter wheels.

A unique any-angle vise is an outstanding feature. Double cradle design, which upon setting, it can instantly be locked into one rigid piece with thumb levers. Vise jaws are 3" long and space between them is 1-9/16". With knee at lowest point, the distance from the bottom of the 6" chip breaker wheel to the bottom of the vise jaws is 1¾".

A REAL WAR PRODUCTION
★ ★ "SPEEDER UPPER" ★ ★



LATHE TURRET

5-STATION OSCILLATING TOOL BLOCK — FOUR INDIVIDUAL SIZES

Use your present Engine Lathe equipment—give it Turret Lathe versatility and productiveness by installing this modern 5-Station Automatic Oscillating attachment on your compound.

An eighth turn of the handle and a lift to a 45-degree position releases the turret head so that it may be turned to any one of the ten positions allowed by the indexing. Indexing is accomplished accurately with a crown clutch arrangement, eliminating any manual lifting of a pin and assuring sustained accuracy. Tool bits may be rotated as well as tilted in any position, allowing for more precise settings and top cutting efficiency.

This is a rugged, money-saving, continuous-duty lathe accessory that becomes an integral part of the lathe. It must not be compared with makeshift, light duty, turret attachments.

Let us send you a copy of our new 8-page bulletin giving money-saving tips.

AUTOMATIC MACHINE AND TOOL CO.

Box 14 — Auburndale, Mass.

SYNTRON
ELECTRIC HAMMERS

Will do those "Nuisance" jobs in your Plant

Quickly - Easily - Economically



Drilling–

in concrete and masonry to hang shafting, anchor machinery, install lighting fixtures, etc.



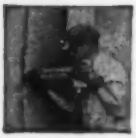
Scaling–

crown sheets, condenser tubes in boiler maintenance, caulking pipe, removing rust and paint, etc.



Redressing–

mill stones, cleaning beater rolls, Jordan bars, shells, plugs, etc.



Cutting–

concrete and masonry for waterproofing, riser holes, door and window openings, channeling for conduit, etc.

Illustrated in Catalog No. 430

SYNTRON CO.

300 Lexington, Homer City, Pa.



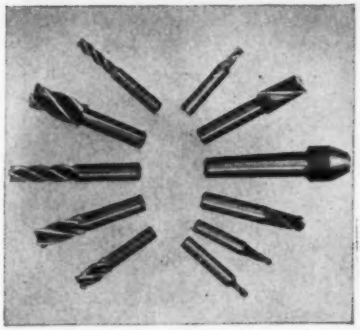
BALL LOADING DEVICE—Balls are loaded onto the ball race of a bomb fuse without loss or error at an eastern plant of the Westinghouse Electric & Mfg. Co., by this device. Balls running down a tube from the hopper are metered by two stops spaced so that the correct number of balls is held between them. Sliding the ball race into the loading position automatically closes the upper stop. Releasing the lower stop allows the balls to run down onto the race. A transparent disc over the race keeps the balls in place, but permits observation by the operator.

WAR-SHIPMENT ADHESIVES

Current Technical Service Bulletin, issued by Paisley Products, Inc., 630 W. 51st St., New York stresses adhesives developed by the firm to meet needs imposed by new types of export packing materials, now in use. Citing a statement by Albert W. Luhrs, Chief, Packaging & Packing Branch, WPB, that serious hazards in shipment are due to rain, condensation, storage, etc., Paisley tells how it has gone after the problem and come up with what it recommends as the answers.

The folder lists adhesives for sealing, laminating, mounting and fabricating, also. For those with special problems, there is a questionnaire, on receipt of which, the firm offers to make analysis and recommendations.

FRAY END MILLS

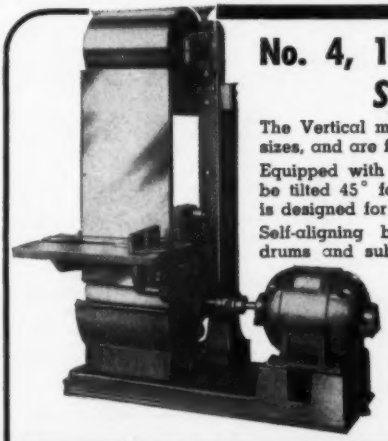


Large scale production is reported to be in progress on Fray Kurl Kut End Mills according to an announcement made by Fray Tool & Reamer Co., 501 W. Windsor Road, Glendale, Cal. These end mills come in 11 styles, each style designed for a specific purpose. They are of fine high speed tool steel, individually heat treated for the size and type of cutter and work for which they will be used.

The Fray line includes: single-end mills, size ⅛ to 2"; long single-end end mills, sizes ¼ to 2"; extra long end mills, sizes ½ to 1¼"; 2-flute end mills, sizes ⅛ to 2"; long 2-fluted single-end end mills, sizes ¼ to 1¼"; ball end mills, sizes ⅛ to 1½"; extra long ball end mills, sizes ½ to 1½"; Brown & Sharpe taper shank end mills, either regular or 4 fluted, sizes ½ to ⅞"; Brown & Sharpe taper shank 2-fluted end end mills, sizes ½ to 1"; fluted chucking reamers with straight shanks, ⅛ to 1½"; rose chucking reamers with straight shanks, sizes ⅛ to 1½"; collets up to and including ½x1/16", all straight shank in either Brown & Sharpe or No. 2 or No. 3 Morse Taper; solid counterbores, sizes 3/16 to 1"; and end mill holders for single-end or double-end, end mills with ⅜, ½ or ⅝" shank diameters.

A recent expansion move in which larger plant facilities were acquired by Fray Tool & Reamer Co., a subsidiary of Fray Machine Tool Co., Inc., permitted this increase in production.

"Keep Tools In Shape To Keep 'Em Firing."



No. 4, 14" Vertical Type High Speed Finisher -

The Vertical machines are made in 9", 14" and 20" sizes, and are furnished with either belt or motor drive.

Equipped with an adjustable work table which may be tilted 45° for edging or beveling, and work table is designed for quick removal of sanding belt.

Self-aligning ball bearings, dynamically balanced drums and substantial construction result in a rigid and vibrationless working surface.

Dust Hoods are hinged and may be quickly and easily swung to one side when changing abrasive belts. Endless Abrasive or canvas belts are furnished for these machines.

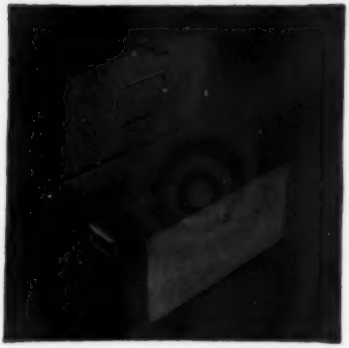
Write for folder giving full details.

PRODUCTION MACHINE CO.

GREENFIELD, MASS.

SPARE PART BOX

This box—an all-welded construction job—was designed for manufacturers who have to ship assortments of spare parts along with the products they're making for the Army and Navy. While only one model is shown, these boxes are made in a wide variety of sizes and styles to meet different requirements. Every box is constructed to standard Government specifications—accurately made.



Because Stackbin has specialized in the production of units for handling parts and materials, they have facilities for turning out large quantities of these spare part boxes rapidly and accurately. They can handle any gauge steel now being specified and are made by Stackbin Corp., 48 Troy St., Providence, R. I.



RECONDITION
YOUR SAWS AT VERY LOW COSTS

Howe - Lindsey Automatic Saw Sharpener, the fastest and most compact machine for sharpening hack saws, band saws, or metal slitting saws. Automatic in action, requiring unskilled labor; will produce nearly perfect cutting tooth, provides for greater production and longer life of blades, saving steel.

HOWE AND SON, INC. HINSDALE N. H.

YODER ROLL GRINDER

Designing and manufacturing of Roll Forming Machines and their rolls have been carried on for over 30 years by The Yoder Co., Cleveland. The "Battle of Production" pressure caused this company to attack a problem that has been troublesome for many manufacturers with less of a roll background—the grinding of rolls.

This has resulted in a simplified grinder which saves time and production cost, and is easier to handle. The high points are:—16" diameter capacity; 20" length between centers; manually synchronized table and cross feeds; 2-speed table feed; 9-speed work head drive; No belt or gear change; precision built high-speed spindle; dust protection; centralized controls.

Grobet
SWISS FILES



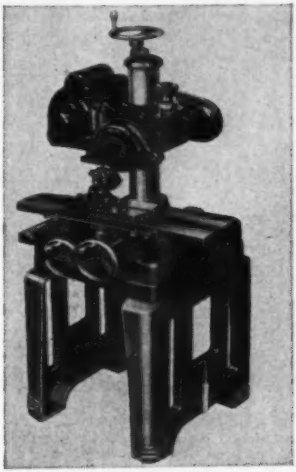
5000 SHAPES and SIZES FOR EVERY PURPOSE

Genuine Grobet Precision Swiss Files are world famous for utmost precision and durability since 1812. Learn more about these chrome steel files — send for Catalog WS, the most complete of its kind.

GROBET FILE CO. OF AMERICA
421 Canal St. New York 13, N. Y.

DELTA CHIP BREAKER GRINDER

A new low-cost Chip Breaker Grinder, said to incorporate the best features of standard grinder design—also many new exclusive features is announced by the Delta Mfg., Co., 604 E. Vienna Ave., Milwaukee. Designed for grinding chip-breaker grooves in Carbide tipped tools, it is also used for grinding form tools, thread chasers etc. An outstanding feature is said to be the Univise which holds work at any desired angle. Removing the Univise, machine can be used as a surface grinder.



The table has long ways so it is always riding solidly. Gibs are provided so that play due to wear can be eliminated. Micrometer collar, with wide graduations on traverse adjustment permits accurate settings. Table is provided with T-slot for clamping fixtures or magnetic chuck in place.

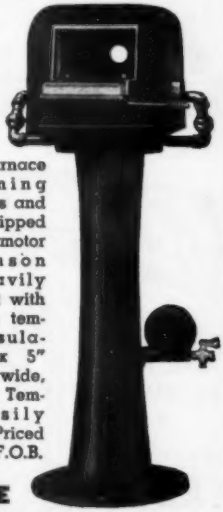
Maximum length that can be ground is 13½"; maximum width that can be ground, 6"; maximum space under 7" wheel to table, 9½"; maximum space under 7" wheel to B & S No. 510 Magnetic Chuck, 6"; Table surface 5¾x13"; Traverse Feed one graduation is .001"; maximum adjustment of wheel by means of micrometer is ⅜". Each graduation is .0005". Minimum diameter cup wheel with standard guard in place, 3½"; maximum diameter wheel, 7".

When days mean VICTORY call for Johnson FURNACES

2 WEEKS DELIVERY

JOHNSON NO. 120 FURNACE FOR HI-SPEED STEEL

Reaches 1500° in Just 5 Minutes



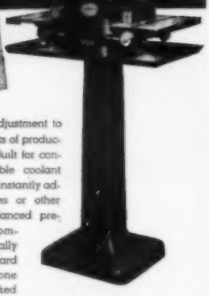
The right furnace for hardening punches, dies and tools. Equipped with G. E. motor and Johnson blower. Heavily lined thruout with quality high temperature insulation. Firebox 5" high, 7¾" wide, 13½" long. Temperature easily regulated. Priced at $129.50 F.O.B. Factory.

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JOHNSON GAS APPLIANCE CO.
584 E. Ave. N.W., Cedar Rapids, Iowa
Please send me free new Johnson Catalog
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Address .....
City..... **State**.....

The CRITERION
Carbide Tool
Grinder

GREATER PRODUCTION CAPACITY



Provides positive rapid adjustment to meet the rigid requirements of production tool manufacturing. Built for continuous service. Adjustable coolant system. Large work tables instantly adjustable without wrenches or other tools. One-third H.P. balanced precision bearing motor completely enclosed and radially mounted in rubber. Standard equipment: One 60 and one 100 grit 7" dia. steel backed silicon carbide wheels. Ideal for metal bonded or Resinoid bonded diamond wheels.

Order from your dealer or write direct. Request literature. No obligation.

CRITERION
MACHINE WORKS
BEVERLY HILLS CALIFORNIA

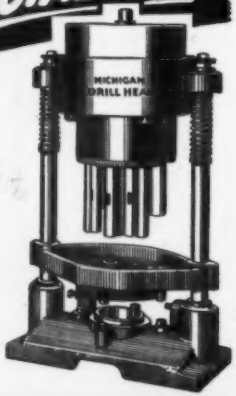
SPECIALISTS-

IN MULTIPLE DRILLING EQUIPMENT

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Pictured—

6 Spindle Head and Bushing Plate with Self Clamping Fixture.



MICHIGAN DRILL HEAD CO.
971 E. 8 MILE ROAD HAZEL PARK, MICH.

THE "HOOVER-RISER"

Bulky work requiring only a light cut that normally ties-up bigger machines can be handled on a Bridgeport milling machine, when a "Hoover-Riser" has been installed. It may be so equipped in a few minutes and increases the over-all capacity of this machine six inches without impairing its rigidity.



The demonstration shows a small hole being bored on an angle in a crankshaft, an operation that otherwise would have had to be done on a horizontal boring mill, employing high priced labor.

Hoover Tool & Die Co., Detroit is the manufacturer and sales are handled nationally by Universal Sales Engineering, 20550 Hoover Road, Detroit, Mich.

"ALNOR" PYROMETERS

for every requirement.

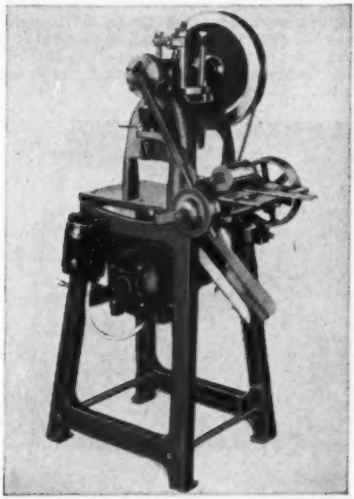
Inexpensive, accurate, durable.

Write for catalog.



Illinois Testing Laboratories, Inc.
150 W. Hubbard St., Chicago

High Speed Stamping Press



Variable speed control between 180 and 550 strokes per minute to suit various punching requirements; arrangement for addition of spacers to provide a die space to 5¼ inches; provisions in the ram to permit boring it out for punch shanks to 1-9/16 inches are features now included in the Diebel Hi-Speed Stamping Press manufactured by the Di Machine Corp., 3654 Lincoln Ave., Chicago.

The Diebel Press will take die sets measuring up to 6¼ by 8 inches. Maximum die space of the standard press is 4-⅛ inches closed but may be increased to 5¼ inches at added cost. The press includes an integral roll feed for strip stock up to 4¼ inches in width. Drive is by a ¾ hp 1140 rpm, 60 cycle, 3-phase motor mounted under the bed. The head design includes a cylindrical ram measuring 4 inches in diameter, and an inserted pitman screw.

Press occupies a floor space of 20 by 32 inches. It is 54 inches high, weighs approximately 500 pounds and has an approximate rating of 5 tons.

Take Advantage of Our Large Stock of

HIGH SPEED AND CARBON DRILLS

WIRE GAUGE, JOBBERS, STRAIGHT SHANK TAPER LENGTH, TAPER SHANK, THREE OR FOUR FLUTE, EXTRA LONG LENGTH.

High Speed and Carbon Taps
Special Thread Taps and Dies
High Speed Machine Reamers
High Speed Combination Drills and Countersinks
Round and Hexagon Dies
High Speed Slitting Saws

Send for a Copy of our 1943 Catalogue on Small Tools and Machinery.

TRAVERS TOOL CO. 5 COURT SQUARE LONG ISLAND CITY, N. Y.

4 MORE ACES UP UNCLE SAM'S SLEEVE



Precision-machined, precision-ground on all diameters and threads.

Elevating shafts . . . vertical training shafts . . . screw leveling shafts . . . just so many metal parts to the uninitiated. To the Jap pilot in a Zero, however, they mean anti-aircraft fire too accurate for comfort. These vital parts of an anti-aircraft gun are typical of the ability of Ace to do fine precision-work on a mass-production basis.

RELY ON ACE FOR PRECISION GRINDING Centerless, Internal Cylindrical, External Cylindrical, Blanchard Surface, Plain Surface, and Thread Grinding.

PRODUCTION MACHINING Turning, milling, drilling, cutting, tapping, and threading of small machine parts that require precision grinding —on a mass-production basis.

METAL STAMPING Blanking, forming, and extruding of small metal parts on presses up to 75-ton capacity. Spot welding, sub-assemblies and assembly of intricate radio and machine parts.

HEAT TREATING Electric and gas furnaces, individually pyrometer controlled, for high-heat, quenching, and carburizing of parts up to approximately 10" x 10" x 15".

TOOL AND DIE WORK All operations for the production of Punches and Dies for small stampings, for Jigs, Fixtures, Gages, Moulds, Form Blocks, Tool Bits and Circular Form Cutters.

Send Blue Print, Sketch, or Sample to

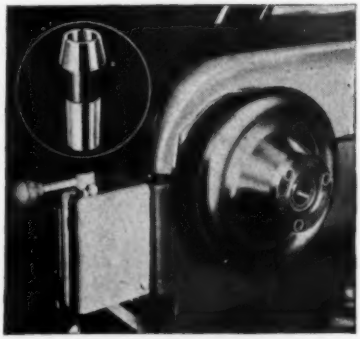
ACE MANUFACTURING CORPORATION

for Precision Parts

1251 E. ERIE AVE., PHILADELPHIA 24, PA.

INCREASING SMALL LATHE CAPACITY

Collet work on stock up to ¾" is now reported possible on small lathes which normally have a capacity of only ½", with the new Speedichuck and the Bren Collet.



This equipment is adaptable to any lathe with a 1½"x8-thread spindle nose having a No. 3 Morse taper on the inside such as Atlas, South Bend, Logan, Clausing, etc. It can also be used on any miller or drill press for accurate chucking work. Quickly fitted to lathe, Speedichuck requires no adapter plate. It is claimed to be the only chuck using a floating closing sleeve which compensates for wear and misalignment of lathe spindle. The 6" handwheel is said to assure maximum gripping pressure on collet with minimum effort, and the heavy construction affords complete rigidity.

The Bren Collet is designed to allow use of full capacity thru spindle. The makers claim it eliminates inaccuracy of conventional type collets which require adapter closing sleeves. Closed by squeeze action, Bren Collet avoids longitudinal movement. Design is thoroly covered by patent applications and the makers are General Die-Stamping-Tool Co., 265 Canal St., New York City.

Every dollar we can spare is needed. — BUY BONDS!

STOODY HARD-FACING ALLOYS

Stoody 1 and Stoody 6, "two new hard-facing" alloys of cobalt, chromium and tungsten are announced. Both are furnished as welding rods for application by Oxy-Acetylene process.

Stoody 1, the harder of the two alloys, provides high resistance to abrasion, corrosion and heat. It is especially recommended for hard-facing pump sleeves, wood saw teeth, carbon scrapers, wire guides, expeller parts, and similar types of equipment.



Stoody 6 is not quite so hard as Stoody 1, but is much more ductile and provides much greater resistance to impact. Stoody 6 is especially useful for hard-facing high pressure, high temperature valves, gasoline and diesel exhaust valves, various types of dies shear blades, cams, etc.

Both are supplied in 1/8, 3/16, 5/16 and 3/8" rod diameters—rod lengths 14".

Folders explaining the characteristics, prices, and applications may be obtained by writing Stoody Co., or any authorized Stoody distributors.

DI-MET RIMLOCK WHEELS

A new series of Di-Met Rimlock diamond abrasive wheels has been developed by Felker Mfg. Co., Torrance, Cal. They differ from former types in increased range of thickness, varying from 1/16" to 1/2". Any width wheel between these limits is available in diameters of 1 to 6". Standard arbor hole dimensions are 5/8" altho other sizes can be furnished as specified.

The bond is said to be a special process developed by Felker which rigidly anchors crushed diamond particles in periphery of cutting wheel, obtaining longer wheel life, faster cutting and excellent surface finish.



ARTUS ARBOR SPACERS U. S. PAT.

Artus Spacers

Made of Plastic in thicknesses from .001"—.030". Each thickness can be identified by its color.

IMMEDIATE DELIVERY

Send for detailed circular and price list.

Industrial Products Suppliers
2 Broadway, New York City

LITTELL



CONTINUOUS STRAIGHTENING MACHINE with Automatic Centering Reel

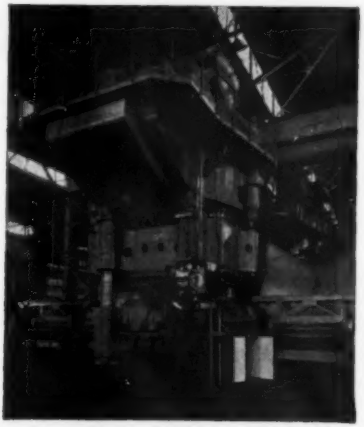
For handling stock of various widths, at speeds of 10 to 60' per min. Portable. Compact. Fits into floor space 17x36". Machine shown equipped with Littell Automatic Centering Reel.

Control arm starts and stops motor and regulates loop of stock between feed and press. Either five or seven straightener rolls may be used. ¾ h. p., 1725 r. p. m., 60 cycle, 220 or 440-volt motor.

Other Littell products include Automatic Centering Reels, various other types of Feeds, Scrap Cutters and Winders, Pres-Vac Safety Feeders, Mechanical Pickers, etc. *REQUEST BULLETINS*

F. J. LITTELL MACHINE CO.
4153 RAVENSWOOD AVE. CHICAGO ILL.

FORMS AIRCRAFT PARTS



This massive 5,500-ton capacity hydraulic press is one of three just completed by Baldwin Southwark Div., Baldwin Locomotive Works, Philadelphia, especially for forming duralumin aircraft parts.

Of rapid-action type, press is completely automatic, having control of pressure, operating speed, and length of stroke. It also is equipped for semi-automatic or manual operation.

Platens are single steel castings and weigh approximately 160,000 lbs. each. Electric motors, totalling 400 hp operate the pumps located on the 30x23 ft. platform, supporting complete power unit, control gear and operating valves.

The press is 33 ft. high and weighs approximately 960,000 lbs.

CLOSED TRADE AUTOM MARK CLOSED

Plain Type — Offset Type

OPEN — OPEN

CONTINUOUS HINGES

All hinges shown can be furnished with special holes, cutouts and bends to blue-print in metals to suit the job.

THREE-FOURTHS OFFSET. — SEMI-OFFSET

AUTO MOULDING & MFG. CO.
2326 S. CANAL ST
CHICAGO

SPECIFICATIONS:
Open Width 1/8" to 6"
Gage Material .040 to .125
Pin Diameter .101 to 3/8
Lengths to 120"



WHITCOMB QUICKCENTER

Designed to meet a long-felt need for a device to remove centering operations from lathes and allow inexperienced operators to center bars quickly, easily and accurately, is the Whitcomb Quickcenter.

It operates by placing work on the vee-block and turning a handwheel until work is held securely between rising vee-block and a lowering button. When tight, work is in line with center line of spindle and hand lever advances center drill to work. Operator moves only the handwheel and lever. This reduces to seconds an operation that often takes over an hour on a lathe.

Quickcenter is equipped with a ¼ hp motor and has speeds of 700, 1300 and 2300 rpm, adjusted by a 3 step v-belt sheave. It centers round bars from ½ to 3" within .005".

Whitcomb Mfg. Co., Troy, N. Y. are the makers.

★ ★ ★ ★

"The Production Line is the Life-Line of America."

SPEEDY! THE *Minneapolis* PRODUCTION LATHE

·★·★·★·

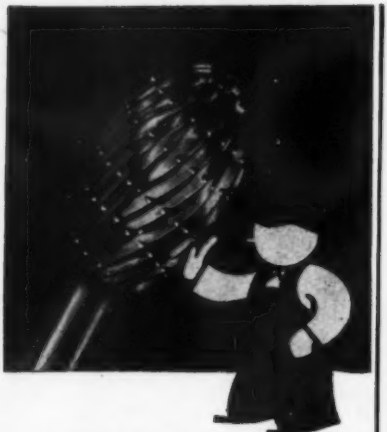
EASY TO OPERATE

A simple, accurate, efficient, HEAVY DUTY machine. Designed for SPEEDY PRODUCTION! Capacity 2¼" round bar. 14" swing. Spindle diameter, 4". Mounted on Timken bearings. Spindle brake. Many other features.

EARLY DELIVERIES



Since 1890 **CENTRAL MACHINE WORKS CO.**
Central and 13th Ave. N. E. Minneapolis, Minn.



WE MAKE WORN TOOLS *Sharp!*

REGRINDING SERVICE SPEEDS UP ACTION OF ANY ROTARY TOOL

To get real production on the finishing of metal castings, dies or patterns, you need the kind of rotary tools that take deep sharp bites. Yeomans Tool Regrinding Service puts your worn tools back in top-notch shape — makes them sharp-toothed and hard biting. For prompt service and a good resharpening job on your Burrs, Die-Sinkers, Reamers, Drills, End Mills and Milling Cutters of any size, shape or quantity send them to:

Yeomans
TOOL CO • 2703 Bay St. Saginaw, Mich.

RADII—ANGLE DRESSER

A versatile precision Radii and Angle Dresser with many noteworthy features is offered by J. & S. Tool Co., 477 Main St., East Orange, N. J. It is simple in



operation requiring no high degree of skill for accurate operation. Any of these results can be obtained with one setting:—One angle; two angles; concave radii up to 6"; convex radii up to 4½"; two angles and radius; many other diversified forms to meet special requirements.

Wheel size capacity is 9" in diameter; angular travel is 3". The Dresser is designed for use on universal surface and cylindrical grinders. Many of the details are obvious from the illustration.

A bulletin giving full details will be sent on request.

BURR KEYSEATERS



Mill keyways in the run or on the ends of shafting already erected — save money on alteration, erection, and repair work.

Made in 4 sizes, for hand or motor operation.

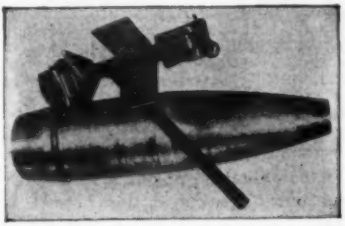
Write for Bulletins and prices.

JOHN T. BURR & SON
429 Kent Ave., Brooklyn, N. Y.

DUAL PURPOSE BOX TYPE HOLDER

To meet shell manufacturer's requirements for a versatile and practical shell marker, a Dual Purpose Box Type Holder has been developed.

It is of special design for stamping identification marks on end and side of semi-finished 155mm shell forgings in one operation. Unique guide plates level both type holders for clear, uniform markings. By eliminating the usual separate handling required for each marking, it is reported that marking costs have been reduced almost 50% and, being manufactured of special "Safety" steel, users are assured of maximum service and safety by the elimination of spalling and mushrooming.



The Company likewise offers facilities to war production manufacturers who may need assistance in solving special marking problems. For further details address M. E. Cunningham Co., 228 E. Carson St., Pittsburgh, (19) Pa.

DI-MET CHIPBREAKERS

A new Di-Met diamond abrasive chipbreaker of unique construction has been developed by Felker Mfg. Co., Torrance, Cal. The Resinoid rim containing the diamonds is bonded to a laminated linen core, rather than a metal core. The linen laminations are interlaid with a resinous compound and baked under high pressure, forming a tough, rigid construction.

The new core has high strength, yet possesses a degree of elasticity. The elasticity is said to act as a cushion, absorbing shock and sudden impact, reducing smoother, softer cutting action. Diamonds are closely graded for size.

The are made in 3, 4, and 6-inch diameters of ⅛" rim thickness and are suitable for rapidly cutting chipbreaker grooves, shaping and form grinding of carbide tips. Similar blades of thinner construction are now available for cut-off operations on carbide inserts.

Makes Old Taps *CUT* Like New!

Don't discard dull taps
Resharpen chamfer easily



ORDER NOW!

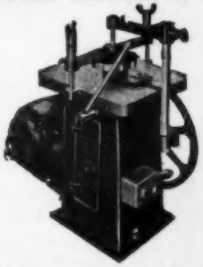
Inexperienced workers can use the NEW READING TAP GRINDER on tool and cutter grinders — surface grinders — even bench lathes.

READING TAP GRINDER HAS:

- Built-in chamfer protractor.
- Simple shifter for 2-3-4 flute taps.
- Variable relief thru adjustment screw — positive lock.
- Easy-to-follow chamfer diagram on index plate.
- Capacity to ¾" hand tap.

Also manufacturers of

READING BROACH KEYSEATER



The Reading Bench Machine does not require bushings or guides. No other machine like it. Very fast capacity from ⅛ to ⅜ cutter. Low first cost — prompt delivery.

READING MACHINE CO.

READING (CINCINNATI) OHIO

BAUMBACH



STANDARDIZED
Machined Steel DIE SETS Semi-Steel

Headquarters for Standardized Die Sets, embodying many exclusive features and embracing more than 195,000 stock sizes and 46 different styles. A die set that is unsurpassed. Let us prove it!

Send for our new 336 Page Catalog.

E. A. BAUMBACH MFG. CO.
1810 So. Kilbourne Ave., CHICAGO, ILL.

OPTICAL COMPARATOR BOOKLET

Intended primarily to present the advantages and possibilities of inspection and measurement by optical projection to those not entirely familiar with the method, is a new booklet, "Beyond A Shadow of A Doubt". Measurement of tools and gages and inspection of production parts by comparing them with a master template or outline by optical projection, is established practice, today, in many important plants. The method has been an aid in stepping up production and improving quality as well as effecting savings in costs and materials. Its adaptation is on the increase.

Among pioneers in the field, Jones & Lamson Machine Co., Springfield, Vt., publishers of the booklet, have developed apparatus for this type of inspection. The booklet gives complete details of the various optical comparators and shows many instances of their practical application to production problems of today.

A combination of our armed forces and our "fighting dollars" can't be beat.

Vernon



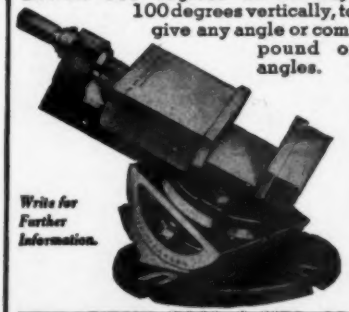
MULTI-ANGLE
VERTICAL
MILLING HEAD

Swivels horizontally and transversely ★ Reversible on overarm ★ 4 spindle speeds ★ Precision pre-loaded ball-bearings ★ Powerful ½ h.p. ball-bearing motor ★ Graduated dials for duplicating setups ★ Takes collets up to ½"

MACHINERY MANUFACTURING COMPANY
Vernon Line of HORIZONTAL MILLS, VERTICAL MILLS and JIG BORERS, SHAPERS and DRILLINGS

New Britain
UNIVERSAL VISE

Swivels 360 degrees horizontally, 100 degrees vertically, to give any angle or compound of angles.



Write for Further Information.

NEW BRITAIN TOOL & MFG. CO.
NEW BRITAIN, CONN., U. S. A.

KENNAMETAL OFFERS NEW CUTTERS

New milling cutters designed for maximum speed and production on milling operations are available thru the international sales and engineering organization of Kennametal, Inc., 135 Lloyd Ave., Latrobe, Pa.



These Grayson-Kennametal cutters are constructed with sturdy bodies of Meehanite tipped with Kennametal. The shock-resistance of the body is combined with the hardness and strength of Kennametal to produce a rugged tool for rapid and accurate face milling, side milling, end milling, slot milling, and straddle milling.

These milling cutters, employing double negative rake angles are available in grade KM for milling steel, and with positive rake angles in grade K2S for rough milling of cast iron or grade K4H for milling aluminum-silicon alloys, magnesium-aluminum alloys, brass, bronze, and most other non-ferrous metals.

NEW TRU-CUT CATALOG

Advancing increased tool life thru reaching a Rockwell of 64-66 and high, uniformly, a new catalog by Tru-Cut Tool Co., 14236 Birwood, Detroit, details the entire line, tool-bits, center drills, keyseat cutters, lathe mandrels and form tools. Many important tables and engineering details are also given.

* * * * *

Get In The Scrap



FOLEY FILED SAWS
Increase Sawing Production

25% TO 40%



Your saws will cut faster and truer and stay sharp longer when filed on a Foley Saw Filer. The exclusive patented Foley jointing principle straightens up uneven teeth and makes them perfect in size, shape, spacing. That is why Foley-filed saws increase sawing production 25% to 40%. The Foley also cuts down filing time, saves on files and reduces saw breakage. Any man or boy can operate the

FOLEY AUTOMATIC SAW FILER

The Foley Filer is the only machine that sharpens cross-cut circular saws 3" to 24" in diameter, band saws ⅛" to 4½" wide—all hand saws.

FILING SAWS FOR VICTORY

The Foley Filer is in use by U. S. Army, Navy, Air Force and many other Gov't Depts.—also by hundreds of War projects and industrial plants.



30-DAY TRIAL OFFER

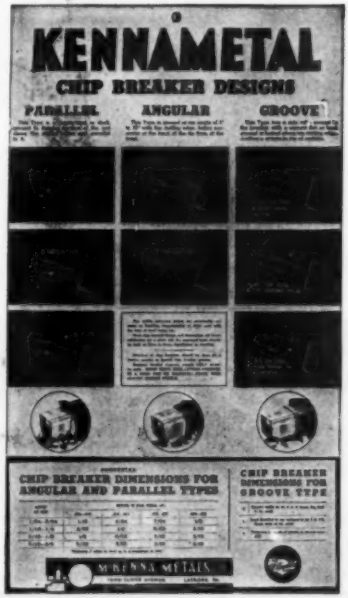
Find out on your own work how much the Foley Filer can save you. We will send it on 30 days' trial. Write for details.

FOLEY MFG. CO.
28 Second St. N.E., Minneapolis 13, Minn.
Also makers of Foley Saw Grinders, Saw Setters, etc.

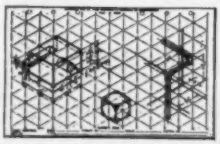
CHIP BREAKER AIDS

Chip Breaker Charts, in 3 colors, presenting dimensional diagrams for correct grinding of parallel, angular, and groove type breakers, are offered by Kennametal Inc., 135 Lloyd Avenue, Latrobe, Pa. Photographs of the 3 chip breaker types and the kind of chips they produce are given.

In addition to precautionary instructions on chip breaker grinding, the charts project chip breaker dimensions for all 3 types relative to depth of cut and feed of operation.



ISOMETRIC SKETCHES ARE EASY TO MAKE AND READ!



One trial will make you another steady user of WADE'S ISOMETRIC blue lined paper. Shows all surfaces and interior to scale. Makes clear blueprints. Saves time daily in hundreds of plants. Write for Circular.

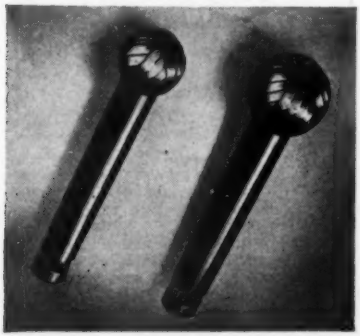
Wade Instrument Co.
1422 E. 109th St.
Dept. H,
Cleveland, Ohio

CARBIDE ROTARY FILES

Cemented-carbide burring tools (rotary files) are being produced by Carbur, Inc., Lincoln Park 25, Michigan.

The tools, known as Carburs, have cutting teeth which are ground from solid on special machines designed and built expressly for this Company. The cemented-carbide heads are securely attached to the steel shanks by a new process.

The makers say that from the results of tests conducted in actual production, and in the aircraft industry in particular, it is indicated that Carburs will provide at least 50 times the tool life of high speed steel burring tools. One report from an aircraft engine manufacturer supports the claim that these tools lasted 100 times longer than steel burring tools in production use on both cylinder heads and crankcases.



Providing a sharp cutting edge over a long period of time, these tools reduce burring time per part and generally increase efficiency in burring operations in all types of production. Because of wear-resistance, fewer replacements are necessary and inventories of burring tools can be reduced considerably. Tool sharpening is reduced in proportion to the life of the tool. Carburs can be run at much higher speeds than have been possible with steel tools—another factor in reduction of finishing time.

At present, Carburs are supplied only in ball end types in ⅜ and ½" sizes. These dimensions refer to diameter of the carbide ball ends. The shanks are .250" diameter and the burring tools are 2½" over-all. Under development are other sizes and shapes which will be announced as production tests are completed.

Just Published -



TOOL DESIGN

Donaldson and LeCain

$3.75

A complete discussion of the design and construction of instruments and tools, written with wartime applications in mind. 536 illustrations.

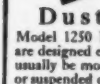
Order from your book-dealer or Harper & Brothers, Publishers,
49 East 33rd Street, New York 16, N. Y.



DUSTKOP

Dust Collector has it.

Model 1250 DUSTKOP (illustrated) and Model 600 are designed especially to save space. DUSTKOPS can usually be mounted behind the dust creating machine, or suspended overhead, or placed under the workbench without interrupting operations. Ideal for small or large grinders and buffers; tool, cutter, surface and internal grinders. Operated by G.E. (or equal) continuous duty motor and fan. Prompt deliveries on high priorities.

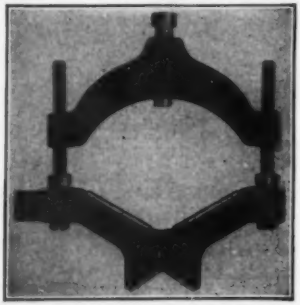


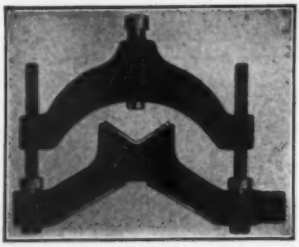
Aget-Detroit Co.

2042 Book Bldg. CAdillac 3090 Detroit 26, Mich.

BARTER-RITCO
Grinding Machine Dog

RUGGED • LONG-LIVED • ADAPTABLE





A versatile and popular tool for over thirty years, specially designed for cylindrical grinders. Its drop forged jaws are exceptionally strong; all adjusting screws and nuts have cut threads hardened to resist wear. The reversible jaw and side adjusting screws give each size wide capacity. Rust proofed.

Five sizes, with capacities as follows:

1"	—from 1/4"	to 1"	round, incl.
1 1/2"	—from 7/8"	to 1 1/2"	round, incl.
2 1/2"	—from 1 1/2"	to 2 1/2"	round, incl.
4"	—from 1 3/4"	to 4"	round, incl.
6"	—from 3"	to 6"	round, incl.

Write for descriptive literature.

Rhode Island Tool Co.

148 WEST RIVER STREET
PROVIDENCE, RHODE ISLAND

Jobbers wanted—
Write us for proposition.

JESSOP COMPOSITE TOOL STEEL

Savings of HSS and other alloy steels ranging from 50% to 80% per tool are claimed possible thru development of a composite steel by Jessop Steel Co., Washington, Pa. This composite steel consists of a section of alloy steel continuously and permanently bonded to a backing of mild steel. The proportions of the alloy section are controllable.



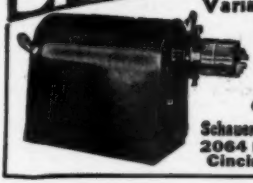
Illustrated is Jessop HS Composite tool steel in bar form which has been machined to specifications for a forming tool. It is then cut to desired lengths for individual tools. Thus, all machining is done on one piece at the same time, eliminating separate machining of each tool.

Use of the composite is said to result in substantial savings in material costs and in critical alloys, at the same time giving performance of solid alloy metal on the inserted or clad section.

Other Jessop steels produced under exclusive license by this patented method include composite die section steel and stainless-clad steel.

SCHAUER
Speed Lathes

Variable Speed



Ideal for lapping, filing, polishing small metal and plastic parts.

Write for Catalog 420.

Schauer Machine Co.
2064 Reading Rd.
Cincinnati, Ohio

CAL-CUTTER MILLING CUTTERS

Machinery Mfg. Co., 1915 E. 51st. St., Los Angeles, makers of the Vernon line of machine tools, are now making carbide tipped milling cutters of many types and sizes under the trade name "Cal-Cutters".

Standard cutter styles are illustrated in their new catalog and include end mills, staggered tooth mills, shell end mills, standard and heavy duty face mills, hyper mills, half side mills, slitting saws, inter-locking cutters, etc.

Of novel design are two new Cal-Cutter types, viz:—bore face mills and adjustable face and step mills. In each of these types the cutters are adjustable for radius, cutters being wedge clamped in the former and available with 2, 3, or 5 tips. The adjustable face and step mill has 4 or 6 tips in two models, each tip being controlled by a micrometer screw.

Cal-Cutters are being made in designs for efficiently milling cast iron, cold rolled steel, heat treated steel, aluminum, dural, etc. Performance is said to be characterized by smooth chatterfree cutting with minimum expended power. A catalog showing all standard types will be sent free on request. Special cutters, other than the standard models illustrated, are being made on special order.



ANNOUNCING "AIR CLAMP"

For Greater Drill-Press Output



Wherever a drill comes down, something must hold the work. Wherever a drilling - jig is required, AIR-CLAMP will simplify it. Wherever speed is desired, AIR-CLAMP will produce it. AIR-CLAMP holds with relentless pressure; is undisturbed by size variations (such as in castings), it scoffs at vibration (how many drills have been broken due to faulty hold-downs?), chatter, snagging. AIR-CLAMP holds work of any size or shape in any position, at any angle. It can pay for itself on a single fixture; it can save its cost on a few days' drill-press output. Reduces operator-fatigue. Saves hours and dollars in drafting room, jig department, tool room and production line. AIR-CLAMP fits any drill-press having a cylindrical column. Special fixtures for Tee-slotted tables, light milling work, etc. Hand and/or foot control. Shipped on approval to responsible concerns.

MEAD SPECIALTIES COMPANY

15 S. Market St., Dept. 83-YA, Chicago 6, U.S.A.

Micro Supreme IMPROVED LAY-OUT DYE

for TOOL, DIE, PATTERN, OR TEMPLATE LAYOUT ON METAL

for SHARPLY DEFINED SCRIBED LINES

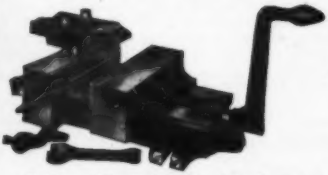
LOW IN PRICE

One Gallon $4.25

MICHIGAN CHROME & CHEMICAL COMPANY

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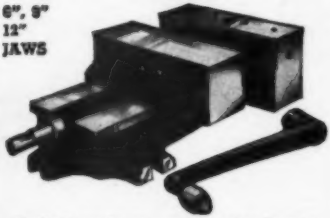
For ordinary holding, as repeat - operation jig or fixture



Graham Vise with Jig Attachments

GRAHAM MULTI-PURPOSE VISE

6", 8" 12" JAWS



Drilled ready to receive attachments

Here is a widely useful vise — MORE than a vise, in fact. By means of its special stops, guides, V-jaws, shell jaws and other attachments, this tool serves as a ready-made jig or fixture for holding special shapes for repeat-operation work. Precision flush, parallel and square construction. Larger sizes are extremely rugged for heavy planer and shaper work. Widely used on drill press, radial, miller, grinder, etc.

Request Illustrated Price Circular.

GRAHAM MFG. CO.

52 Bridge Street East Greenwich, R. I.

AN all-purpose contour and cutoff band saw for wood or plastic stock up to 8⅝" thick is being offered by Boice-Crane Co., 931 Central Ave., Toledo, Ohio, in bench and floor models. The deep throat allows 27" diameter cutting.



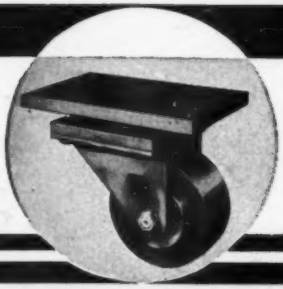
The wheels are said to be made of strong, light materials for high speed and vibrationless operation. An easy-to-read accurate blade tension scale is provided.

The framework is a solid one-piece steel structure. The wheel guard swings on a single hinge and must be closed before machine can operate. The handy telescoping guard on the blade holds by friction when lock handle is released. It cannot drop.

Pattern and fixture makers will appreciate the newly designed blade guides which handle all blades from ⅛ to ¾" and adjust by a single knob control.

The 15 by 15½" table is rigidly supported by heavy trunnions and will not sag under heavy cuts. It tilts 45° to the right and ten to the left. The degree of tilt is indicated by an accurate scale.

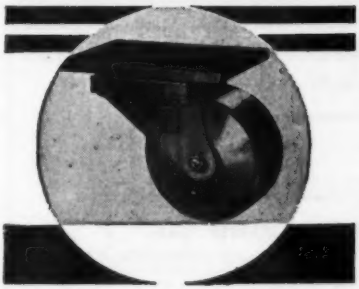
Every Bond you buy today will help speed Victory!



DARNELL CASTERS

Precision-made Darnell Casters with the DOUBLE BALL-BEARING SWIVEL assure a long life of efficient, economical service

DARNELL CORP. LTD.
LONG BEACH, CALIFORNIA
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GEARS of known EFFICIENCY

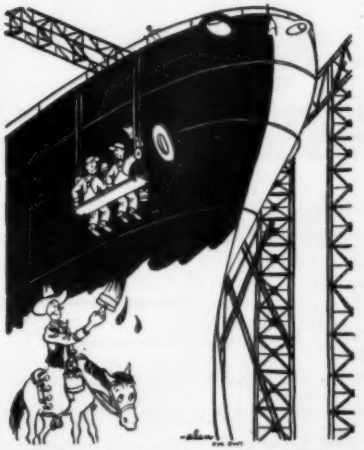


Abart GEARS

Abart Gears have records of years for precision—high sustained efficiency—dependability. *Any material. No stocks.* Send B/P or specifications for estimate.

ABART SPEED REDUCERS—Wide selection worm and spur gear. Send for Catalog.

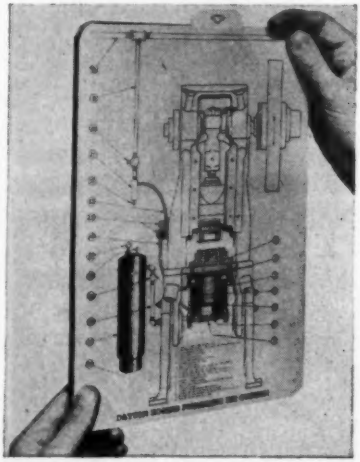
Abart GEAR AND MACHINE CO
MANUFACTURERS OF
Speed Reducers & Gears



"COWBOYS ARE FUNNY THAT WAY—RATHER RIDE THAN WALK"

DIE CUSHION WORKING MODEL

The Dayton Rogers Mfg., 2835-12th Ave., South, Minneapolis, Minn. offers for free distribution, a die cushion cutout model showing the details of pneumatic die cushion equipment as applied to the average punch press. This cutout model is 8½x11", of laminated cardboard. Pressing arrow at top, detailed information is given visually of the working principles of pneumatic die cushion equipment as applied to punch presses. It shows in detail how the blank is automatically held in tension—how the press tools produce a strong, smooth shell thruout the work



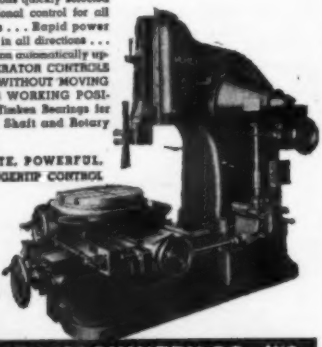
cycle of the draw die. Also shown are details of using a single action press in place of a double action press, or where a double action press can be used in place of a triple action. Complete details are also given as to the basic working parts of any standard die cushion, together with complete piping diagram for the installation and use of pneumatic die cushion equipment.

Use your company letterhead in writing.

MOREY *Designed and Built FOR Precision PLUS Production*

VERTICAL SHAPERS 8"–12"–14" STROKES

Four cutting Speeds . . . Infinite feed variations quickly selected . . . Directional control for all movements . . . Rapid power movements in all directions . . . Brake for Ram automatically applied . . . OPERATOR CONTROLS MACHINE WITHOUT MOVING FROM HIS WORKING POSITION . . . Timken Bearings for Bull Gear, Shaft and Rotary Table . . .



ACCURATE. POWERFUL. FAST. FINGERTIP CONTROL

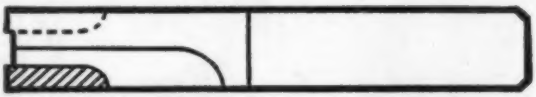
Ask for Circular No. 726A

MOREY MACHINERY CO., INC

410 Broome Street New York, N. Y.

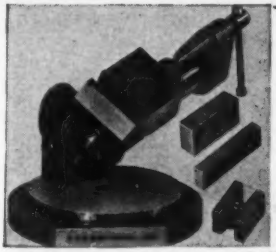
½" Straight Shank Carbide Tipped End Mills

$12.50 each



CARBIDE TOOL ENGINEERING CO.

4439 LINCOLN AVENUE Phone Longbeach 7793 CHICAGO, ILLINOIS



CUT SET-UP TIME IN HALF WITH . .

F & H UNIVERSAL VISE!

Just dial the angle. • For grinding compound angles as easily and quickly as simple angles. Suitable for drilling, light milling and other machining operations as well as for layout work. • Available with grinding wheel angle attachment. • Vise may be had with 2", 4" or 6" jaws.

IMMEDIATE DELIVERY

For Clamping Odd-Shaped Pieces. • F & H Equi-Hold for instant clamping of work pieces with unparallel planes. Consists of two friction plates, jointed together by ball and spring socket. • Write for complete information to:

F & H MANUFACTURING CO. 10338 Gratiot Ave., Detroit, Michigan

10" TILTING ARBOR SAW

It is unnecessary to tilt the table in sawing bevel cuts. This has been eliminated by tilting the blade on the new 10"



Tilting Arbor Saw manufactured by Boice-Crane Co., 931 Central Ave., Toledo, Ohio. More accurate and smoother cutting is also claimed.

Cross-cutting of 13" wide stock has been made easy by a wide working zone in front of blade. Plenty of out feed support is afforded by the 5½" table space behind blade.

A one-knob "lightning-fast" fence control with automatic rear fence locking finger is operated from the front. It aligns as it micro-sets and eliminates necessity of reaching over blade. Secure and accurate alignment is claimed on the first lock-up.

Features include a ground table which measures 20x27", a patented "auto-set" screw which stops tilt of blade exactly at 45° and 90°. A degree dial is provided for setting "split hair" angles, and a dust chute directs sawdust away from motor.

Table bars may be centered on ordinary work or may be instantly extended to 21" capacity. A table extension may be attached readily.

Work is prevented from creeping away from blade by a mitre gauge clamp attachment.

The safety guard has been approved by State Industrial Safety Commissions. A hood shields the entire saw-blade, tilts with blade, and drops to table after the passage of work.

FAMCO FOOT PRESSES

FOR PRECISION AND SPEED

ON SMALL JOBS

For complete information on 10 different sizes and models, stand and bench mounting types, write to

FAMCO MACHINE COMPANY

1320 18th STREET, RACINE, WIS.

famco Foot and Arbor PRESSES



AMEs *Hundred Series*
DIAL INDICATORS



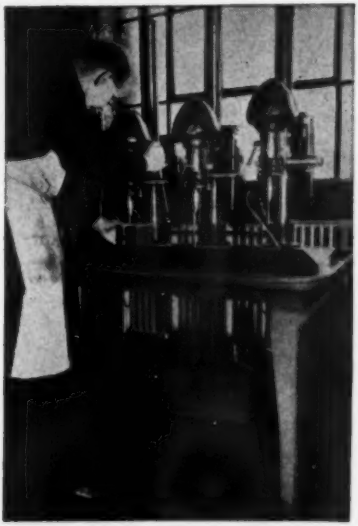
A COMPLETE NEW SERIES

These Dial Indicators have all the desirable features for measuring and checking accuracy. Four sizes to American Gage Design Committee specifications. Fourteen different dial numberings. One-piece, drop-forged cases and stems. Wire attached bezels. Cup-shaped dials that need no springs beneath. Pinions and staffs of hardened steel, ground for accurate fitting and long wear. Various styles of backs and contact points. The best and most effective shock-absorbing wheel assembly, optional.

SEND FOR CATALOG NO. 52

B. C. AMES CO.
WALTHAM, MASS.

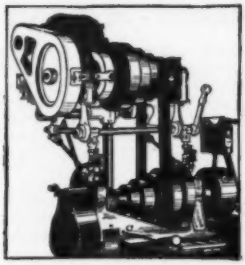
PORTABLE COOLANT PUMP



A self-contained, portable unit, Model 16-S, with Tank, quickly moved from one machine to another, is announced by Eastern Engineering Co., 45 Fox St., New Haven, Conn. It is claimed husky enough for permanent installation, compact design permitting installation in comparatively small space. It is aimed to do away with need of hand application of coolant on lathes, grinders, drill presses, cut-off saws, millers, etc., flow being easily governed to meet varied conditions.

Tank size is 16" long x 10" wide x 9" high.
Motor height above tank-4¾".
Weight-40 lbs.
Motor-1/30 H. P., 1525 RPM, air jacketed, fan-cooled, totally enclosed motor for operation on 110 volt, 60 cycle, 1 phase current.
Type pump is centrifugal.

Let's buy BONDS and own a share in our final VICTORY.



STRENGTH

In Remco Motor Drives strength is as carefully engineered as in a modern steel bridge. Rigid three point suspension, instead of the customary one or two points. Vibrationless! No overhang. No strain on tool. Simple installation. Low price. Write — Remco Products Corp., State St. at R. R., York, Pa.

REMCO MOTOR DRIVES

for LATHES, SHAPERS, DRILLS, MILLING MACHINES, etc.

HILL-BARTELT THREAD MILLERS

The Hill-Bartelt Machine Co., 229 S. Church St., Rockford, Ill., offers two models of a newly designed thread milling machine. Illustrated, is a single-purpose machine set up for production runs on a specific job. The other model is a general-purpose machine with adjustments permitting change of set-up for a wide variety of work.

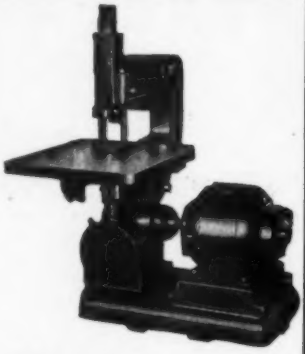


These thread millers are of modern design thruout, fully motorized, with all driving elements completely enclosed in a rugged and rigid structure. Electrical controls and the coolant system are also fully enclosed, with suitable access doors and plates. Spindle is 40" from floor and machine requires only 42¼x28" of floor space. The same main elements are used on both the single-purpose and general-purpose machines.

The single-purpose model can be made up for cutting either rh, or lh external or internal threads, using a multiple type thread mill. Feed is accomplished with a cam, synchronized with work spindle, governing complete cycle including rapid return and a dwell for reloading. Work up to capacity of 3" diameter, is held in an air-operated collet chuck. Controls include start and stop buttons for motors, feed clutch release lever, and chuck-operating handle. Because of its sturdiness and simplicity of operation, this model, for example, has been found well-suited to the threading operation on the nose of 75mm shells.

The general purpose model, with the same basic elements, has a much wider range of application. The cutter head has a tilting adjustment for aligning cutter with helix angle of thread. Either single or multiple type cutters may be used. Two types of feed are available, either cam feed or lead screw, and may be selected as desired. Machine will cut threads from five to 32 pitch, up to 9" in length with a single cutter. Additionally, a controllable cross feed permits cutting of pipe threads, or partially tapered threads. For added work support, a tailstock is included, riding on V-ways.

An idle machine may cost lives on the fighting front. Stay on the job! Keep your machines rolling.



OLIVER
DIE MAKING MACHINES

THE basic needs of faster, smoother sawing and filing are met with the Oliver Die Making Machines. Operating efficiency is increased 50 to 60 per cent over hand methods in the making of precision dies, gages, cams, templates and similar products requiring rapid and accurate filing, sawing and lapping operations.

Send for literature describing the line of Oliver Die Making Machines!

●

OLIVER INSTRUMENT COMPANY
1468 Maumee St., E. - Adrian, Mich.

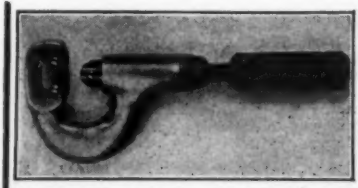
We also build Drill Grinders, Tool and Cutter Grinders, Face Mill Grinders, Template Tool Bit Grinders.

FOREMEN'S RADIO CONVENTION

The first national convention ever held by radio will be staged in September over a nationwide network by the National Ass'n of Foremen, it was announced by Frank H. Irelan, Vice President of the N. A. F. and Chairman of its committee, whose headquarters are in Dayton.

Desire to aid in the war effort by eliminating the convention's normal demand for transportation and hotel accommodations for several thousand men and by enabling the members to remain on their jobs in wartime production instead of traveling as delegates to a convention city, inspired his committee's novel plan according to Mr. Irelan.

The convention may also be the briefest in history, as the network program will be limited to one hour, with speakers of national prominence discussing questions of universal interest to American industry. Thruout the country, member clubs of the Ass'n will hold local meetings at which they will listen to the national broadcast and then proceed with localized discussions by members and by other industrial leaders.



WADE Knurling Tool

For knurling long or slender work . . . easily and quickly, without any bother of adjusting it in the tool post. Knurl is fed into work by the screw on handle. Plunger carrying knurl is keyed so it cannot turn. Tool is 7" long. Maximum capacity is ¾" diameter. Minimum capacity 3/32".

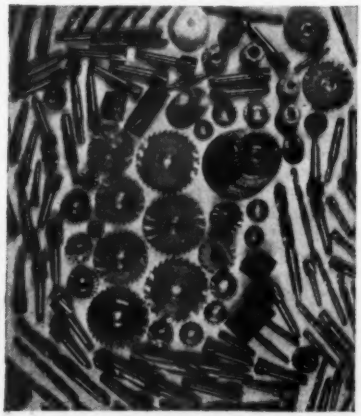
Write for full details.

WADE TOOL CO.
WALTHAM, - MASS.
ALSO WADE BENCH LATHES AND HAND KNURLING TOOLS

WORKERS LEND TOOLS



When production requirements created an unexpected heavy demand for drills, taps, reamers, saws, and miscellaneous tools at General Electric's Pittsfield Works recently, maintenance department workmen loaned the Company a total of 992 small tools from their own chests, augmenting a salvage and reclamation program which averted an emergency.



The personal tool chest collection was in response to an explanation of the situation by the maintenance department foremen, who promised that the tools turned in would be replaced by the Company as new tools were obtained. Among the 992 small tools contributed by the men were straight and taper shank drills, taps, and reamers, with a total value of $1198, and they were all fit for immediate use.

Meanwhile, thru the plant's salvage and reclamation program, 1700 pounds of high-speed steel tools were recut at a cost of $2500 into new tools with a value of approximately $4500. Tools which could not be reclaimed were sold to toolmakers after being spark-tested and classified according to type of steel.



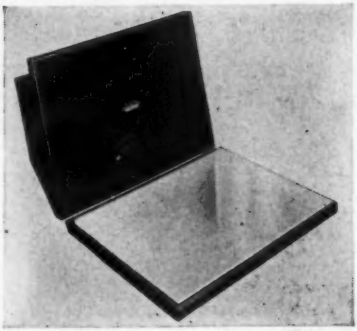
"The Tool You Break Will Never Make the Parts Their Lives May Depend On!"

GLASS SURFACE PLATES

Valuable and distinctive advantages are claimed for surface plates of glass, as announced recently by Martin-Omberg Engineering Mfg. Co., 708 20th Ave., Nashville, Tenn.

Surface accuracy, from .0002 to plus .0005, is said to be unaffected perceptibly by temperature variations, corrosion, rusting, burring or warping, nor is there any degreasing problem. They are readily portable.

Visibility is said to be better, thru the clear glass.



Another important advantage is that these plates can be much more economically produced, effecting first-cost savings well proportioned to savings in up-keep and maintenance.

Pamphlet issued by the manufacturer gives complete details.

HITLER: We are coming closer and closer.

This BOOK tells how to speed your Inspections



Send for your free copy

with the *NEW*

TRICO MICRO-CHEK PRODUCTION GAGE



More than 2700 war plants now use thousands of TRICO MICRO-CHEKS to speed up the gaging of millions of precision parts. With it, inexperienced workers quickly become dependable inspectors. Our new booklet shows many further uses of this accurate, speedier gage. Write for this information.

TRICO

TRICO PRODUCTS CORP.
Room 110 Trico Building
Buffalo, N. Y.

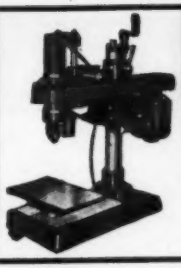
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BUFFALO'S MOST CONGENIAL HOTEL

★ Today, you'll enjoy your stay at Hotel Lafayette more than ever! Extensively remodeled and redecorated, this fine hotel offers new convenience and comfort—but the friendly hospitality is the same as ever. Excellent food, home-like rooms, reasonable prices. And remember: Hotel Lafayette is Buffalo's most centrally located hotel. Moderate rates: Single, $2.75 up; Double, $4.50 up; special rates for 4 or more.

Write for Folder J.

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BUFFALO, N.Y.
H. A. KELLY MANAGER



The HAMILTON MUEHLMATT Super Sensitive DRILLING MACHINE

SAVE ON SMALL DRILLS

FOR AIRCRAFT, DIESEL, INSTRUMENT DRILLING

. . . wherever .004 to 5/16" holes are needed

Precision drilling at its finest . . . dependably accurate. Write us for details.

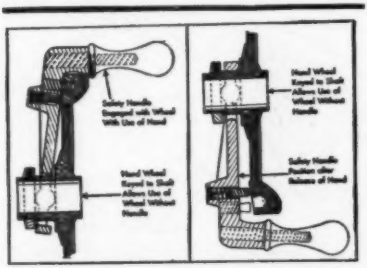
THE HAMILTON TOOL CO.
Ninth and Hanover Streets,
HAMILTON OHIO

SAFETY HANDLE WHEEL

Safety engineering and design are embodied in this Safety Handle Wheel for all types of metal and woodworking machines, according to the maker, Gibbons Mfg. Co., 11 Gordin St., Worcester, 4, Mass.

To strike Handle in any way will not engage the Safety Handle with the wheel while in or out of motion. The wheel keyed to the shaft allows necessary adjustments without the use of the Safety Handle.

The device is especially recommended by Gibbons for rapid-traverse machines, where handle wheels or cranks are in rapid motion, with consequently increased hazard to operators.



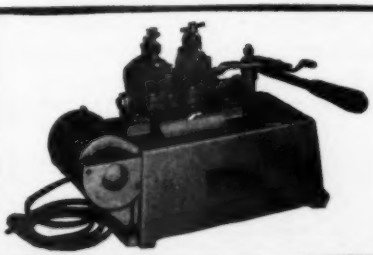
Wheels are available to replace any existing type or crank on machines, and are claimed, according to the manufacturers experience, to effect worthwhile increases in production, as they leave operator free to devote his full attention to work in hand, eliminating one definite mental hazard otherwise involved.

THREAD GAGES FROM STOCK

In an effort to speed delivery of thread gages to war industries, Detroit Tap & Tool Co., 8432 Butler Street, Detroit, Mich., is endeavoring to maintain as extensive a stock on such gages as possible.

Since the tremendous demands for thread, plug and ring gages prevents carrying a complete stock at all times, Detroit Tap is currently isuing stock record lists every 15 days for distribution to industry.

The stock record sheets, indicating sizes and types of gages currently available, are shipped about the 1st and 15th of each month to field representatives of the Company in various industrial sections of the country for redistribution.



BAND SAW WELDERS

The No. 141 Bench Type Metal Working Band Saw Welder is available with or without grinder. Work can be annealed without removing from the Welder. Band saws up to ¾" wide may be welded.

1 KVA—110 Volt—60 Cycle—single phase—5 point heat control—1 point anneal heat—Weight 40 lbs. Let us send you further details.

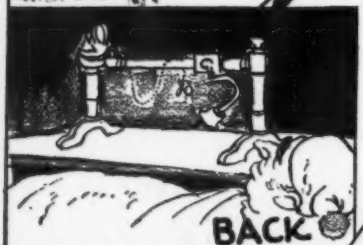
Mfrs. of complete line of Spot, Butt, Seam, Flash, Projection and Special Welders.

WELDEX INC., 7325 McDONALD AVE., DETROIT, MICH.

Mechanics Through the Ages



OUTSTANDING SMITHS DID MUCH TRAVELING DURING THE MIDDLE AGES! THEY WERE OFTEN CALLED FROM GREAT DISTANCES TO HANDLE INTRICATE WORK . . . .



BACK

IN THE 1820'S, WHEN GRANDPA WANTED TO AVOID OVERSLEEPING, HE LAID HIS THICK POCKET WATCH IN THIS CONTRAPTION, ATTACHED THE WATCHWORKS BY A LEVER TO A WEIGHTED STRING WHICH PASSED OVER A NOTCH IN A TRIP LEVER; AND AWOKE NEXT MORNING TO HEAR THE BELL MERRILY RINGING!



DISCARDED

MUSKET BARRELS SERVED AS PIPING TO CONVEY GAS IN ENGLAND DURING THE EARLY DAYS OF GAS ILLUMINATION. THE BREECH ENDS OF THE BARRELS WERE BROACHED AND TAPPED. THE MUZZLES WERE SCREWED EXTERNALLY SO THAT THE TWO COULD BE CONNECTED.

These ARE THE CEMENTED-CARBIDE TIPPED TOOLS SUPPLIED AS *Standard* BY CARBIDE FABRICATORS



48 HOUR DELIVERY

ON TURNING TOOLS SHOWN ABOVE

The wear resistance of cemented-carbides is available to you in many different types of standard tools manufactured by Carbide Fabricators.

The standard turning tools shown above—ground ready for use and which also meet many requirements for boring and facing jobs—are produced in large volume to be carried in stock. Simplified pricing of these tools makes possible one low unit price regardless of the number of tools which are ordered.

Reamers, end mills and core drills are all produced to a high degree of accuracy. Machine reamers, shell reamers, end mills and shell core drills are held to size within a total tolerance of .0005". When specified, closer tolerances can be supplied at a slight additional charge.

Complete information on any of these tools will be supplied immediately upon request.

We are authorized suppliers of Carboloy, Vascoloy-Ramet and Firthide cemented-carbides.



Carbide Fabricators Co. ROYAL OAK MICHIGAN

MFRS OF STANDARD AND SPECIAL CEMENTED CARBIDE TIPPED TOOLS

THE EXECUTIVE WHO STOPS TO THINK . . .



Knows that "10% for War Bonds isn't enough these days"

Workers' Living Costs going up . . . and Income and Victory Tax now deducted at source for thousands of workers . . .

Check! You're perfectly right . . . but all these burdens are more than balanced by *much higher* FAMILY INCOMES *for most of your workers!*

Millions of new workers have entered the picture. Millions of women who never worked before. Millions of others who never began to earn what they are getting today!

A 10% Pay-Roll Allotment for War Bonds from the wages of the family bread-winner is one thing—*a 10% Pay-Roll Allotment from each of several workers in the same family is quite another matter!* Why, in many such cases, it could well be jacked up to 30%—50% or even more of the family's *new* money!

That's why the Treasury Department now urges you to revise your War Bond *thinking*—and your War Bond *selling*—on the basis of *family* incomes. The current War Bond campaign is built around the family unit—and labor-management sales programs should be revised accordingly. For details get in touch with your local War Savings Staff which will supply you with all necessary material for the proper presentation of the new plan.

Last year's bonds got us started—*this year's bonds are to win!* So let's all raise our sights, and get going. If we all pull together, we'll put it over with a bang!

This space is a contribution to America's all-out war effort by



you've done your bit
. . . now do your best!

★ ★ ★ ★ ★ ★ ★ ★ ★

HITCHCOCK PUBLISHING COMPANY

542 So. Dearborn St., Chicago 5, Ill.

VICTOR'S BARGAINS IN

Tungsten Carbide Tipped Tools

Price $1.00 Each In Any Size

PROMPT DELIVERIES

New Low Prices. — Increase Production — Cut Operating Costs

Tools are tipped with Tungsten Carbide, and are suitable for machining cast-iron, brass, bronze, aluminum, non-ferrous materials (such as hard rubber, bakelite, fibre), and tough alloy steels up to 500 Brinell hardness.



Left—100 Series

Left Hand-Reverse Image, Right Hand Shown

Tool No. RH	LH	Shank Size
R-100	L-100	¼x¼x2
R-101	L-102	5/16x5/16x2¼
R-103	L-104	⅜x⅜x2½
R-105	L-106	7/16x7/16x3
R-107	L-108	½x½x3½



Right—200 Series

Tool No.	Shank Size
200	¼x¼x2
201	5/16x5/16x2¼
202	⅜x⅜x2½
203	7/16x7/16x3
204	½x½x3½

Below—300 Series

Tool No.	Shank Size
300	¼x¼x2
301	5/16x5/16x2½
302	⅜x⅜x2½
303	½x½x3½



STANDARD TUNGSTEN CARBIDE TIPPED TOOL BITS

In lots of 12 assorted in any Series; 100-200-300 Series an extra 10% will be allowed; also in lot of 50 assorted 20% discount will be allowed.

Sizes not listed as well as special TIPPED TOOLS will be quoted upon request. When ordering, state tool number and quantity desired.

We Carry Silicon Carbide Emery Wheels for Grinding Tungsten Carbide Tool Bits

SEND FOR OUR CIRCULARS

Victor Machinery Exchange, Inc.

251 CENTRE STREET **NEW YORK, N. Y.**

COMBINATION CENTER DRILLS
Special Alloy and High Speed Steel
Regular Type



Ground with Radial Relief

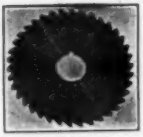
Included angle 60 degrees. Other angles made special to order.

Size	DIMENSIONS Dia. Body	Dia. Drill	Length Overall	PRICE PER DOZEN Semi-H. S. Steel Net	H. S. Steel Net
A-1	1/8"	3/64"	1¼"	$2.50	$7.20
C-2	13/64"	1/16"	1⅞"	3.00	7.20
D-1	15/64"	5/64"	2"	3.25	7.20
E-1	3/16"	3/32"	2⅛"	3.50	7.20
E-2	3/16"	1/8"	2⅛"	3.50	7.20
F-1	7/16"	5/32"	2¾"	4.50	10.80
F-2	7/16"	3/16"	2¾"	4.50	10.80
J-1	1/2"	7/32"	3"	.....	16.20
J-2	1/2"	9/32"	3"	.....	16.20
M-1	5/8"	7/32"	3¼"	.....	21.60
M-2	5/8"	9/32"	3¼"	.....	21.60
N-1	3/4"	1/4"	3½"	.....	28.80
N-2	3/4"	5/16"	3½"	.....	28.80

PROMPT DELIVERY

Victor Machinery Exchange, Inc.
251 Centre Street • New York, N. Y.

HIGH SPEED SLITTING SAWS



THESE SAWS ARE HOLLOW GROUND

Dia.	Width	Hole	Our Price Net Each High Speed
2½	1/32	⅞	$1.68
2½	3/64	⅞	1.68
2½	1/16	⅞	1.68
2½	3/32	⅞	1.68
2½	1/8	⅞	1.68
3	1/32	1	1.98
3	3/64	1	1.98
3	1/16	1	2.04
3	3/32	1	2.04
3	1/8	1	2.10
3	5/32	1	2.20
4	1/32	1	2.58
4	3/64	1	2.64
4	1/16	1	2.70
4	3/32	1	2.82
4	1/8	1	3.00
4	5/32	1	3.12
4	3/16	1	3.30
5	1/16	1	3.48
5	3/32	1	3.78
5	1/8	1—1¼	3.96
5	5/32	1—1¼	4.20
5	3/16	1—1¼	4.44
6	1/16	1	4.38
6	3/32	1	5.02
6	1/8	1—1¼	5.16
6	3/16	1—1¼	6.24
8	1/16	1	10.00
8	1/8	1—1¼	10.50
8	3/16	1—1¼	11.88

PROMPT DELIVERY

Victor Machinery Exchange, Inc.

251 Centre Street • **New York, N. Y.**

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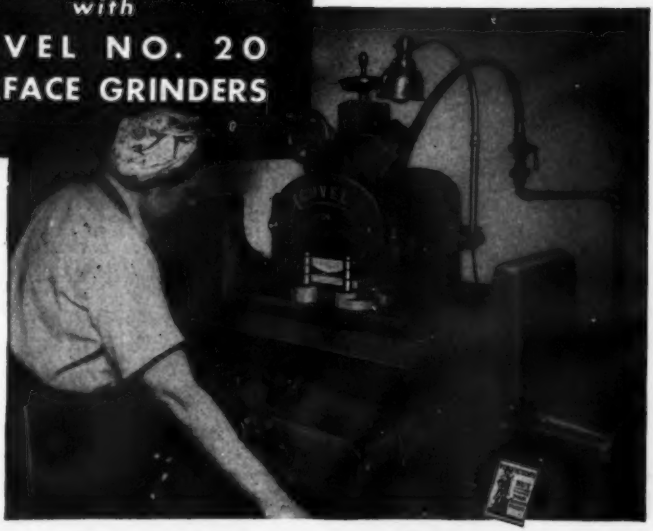
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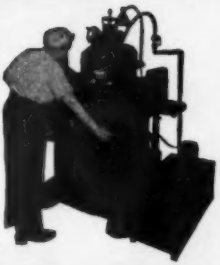
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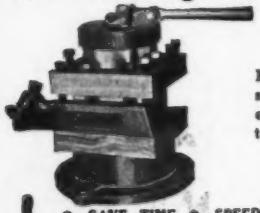
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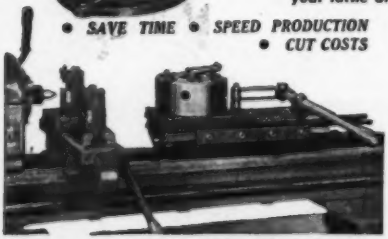
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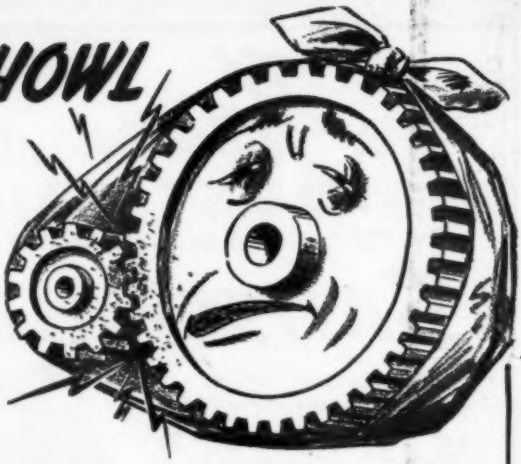
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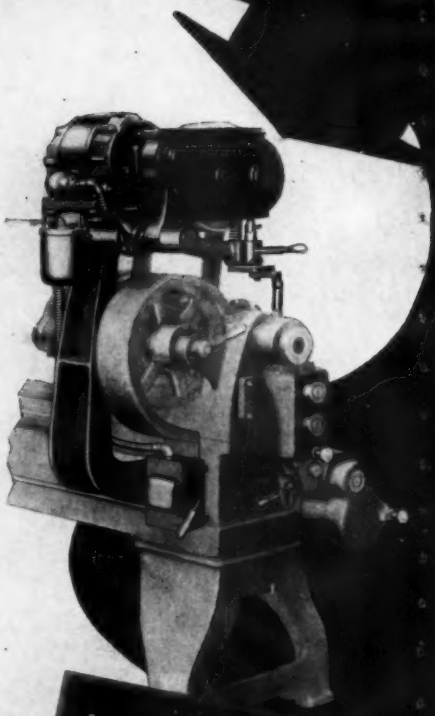
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